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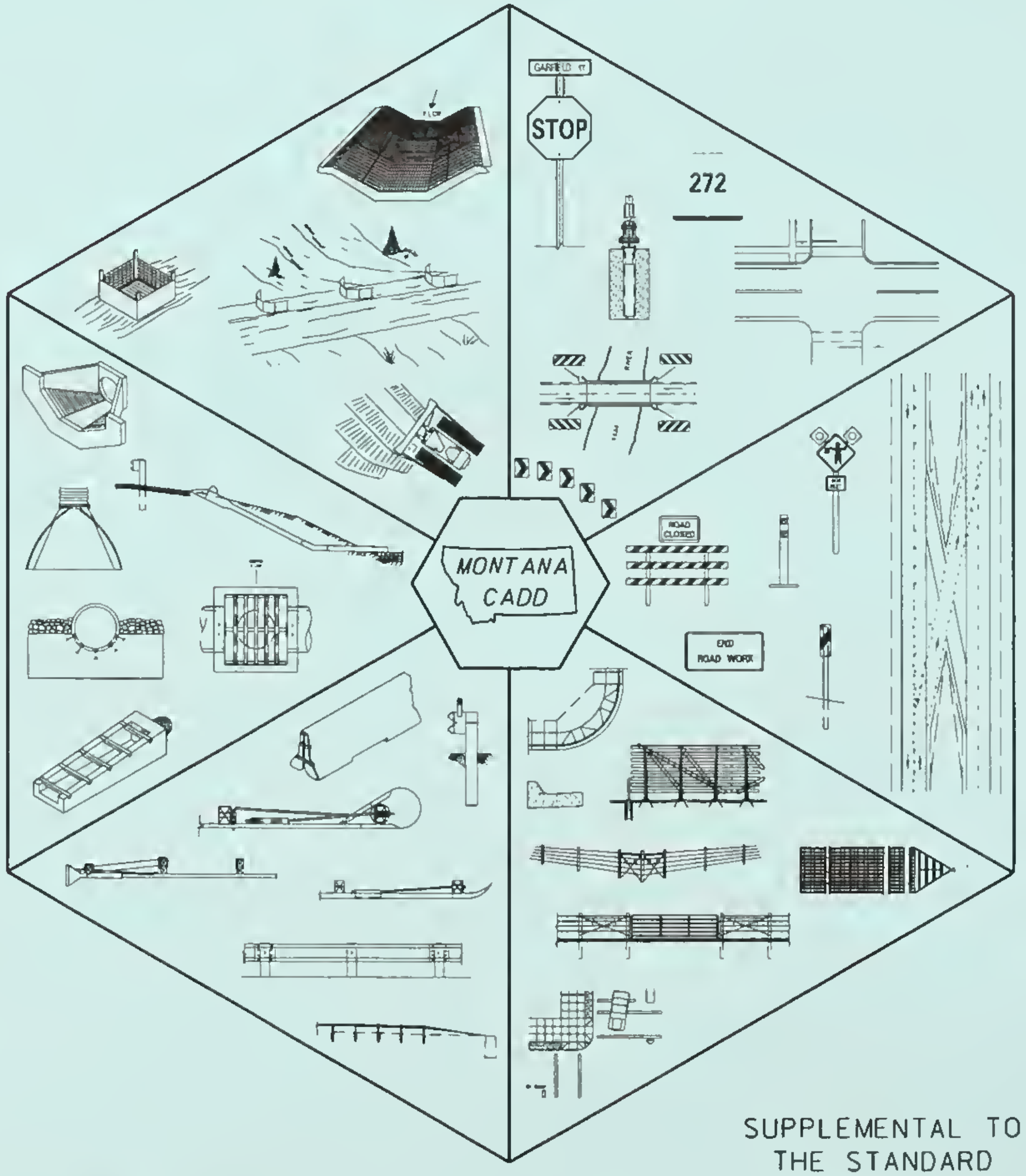
DETAILED DRAWINGS

METRIC EDITION

EFFECTIVE: AUGUST 1999



MONTANA DEPARTMENT
OF TRANSPORTATION

SUPPLEMENTAL TO
THE STANDARD
SPECIFICATIONS FOR
ROAD AND BRIDGE
CONSTRUCTION

MONTANA STATE LIBRARY

DETAILED DRAWINGS

FORWARD

ENCLOSED IS THE CURRENT SET OF DETAILED DRAWINGS CONSISTING OF METRIC DIMENSIONS AND QUANTITIES. IT IS A COMBINATION OF HARD AND SOFT NUMBERS. WHERE INDUSTRY HAS ALLOWED, HARD NUMBERS HAVE BEEN SPECIFIED. THE REMAINING NUMBERS HAVE BEEN SOFT COVERTED AND ROUNDED AS APPROPRIATE. AS INDUSTRY CHANGES AND PROGRESSES, SO WILL THE DETAILED DRAWINGS.

IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS, COMPLY WITH REASONABLE AND CUSTOMARY MANUFACTURING AND CONSTRUCTION TOLERANCES WHERE WORKING TOLERANCES ARE NOT SPECIFIED.

SOME DISCREPANCIES MAY BE FOUND, IMPACTING THE CONSTRUCTABILITY OF CERTAIN ITEMS. PLEASE REPORT PROBLEMS AND ERRORS TO THE CONSTRUCTION BUREAU SO THAT THEY MAY BE RESOLVED IN FUTURE DETAILED DRAWINGS.

DETAILED DRAWINGS

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A.A.D.T.	ANNUAL AVERAGE DAILY TRAFFIC
AASHTO	AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS
AB.	ABRUPT
A.C.	ALUMINUM CAP OR ASPHALT CEMENT
ADD. EXC.	ADDITIONAL EXCAVATION
ADJ.	ADJUSTED
A.D.T.	AVERAGE DAILY TRAFFIC
AGG.	AGGREGATE
AH.	AHEAD
ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE
APP.	APPROACH
APPL.	APPLICATION
APPROX.	APPROXIMATE
ASPH.	ASPHALT
ASTM	AMERICAN SOCIETY FOR TESTING & MATERIALS
AVE.	AVENUE
AVG.	AVERAGE
AZ.	AZIMUTH
BAL.	BALANCE
BBL.	BARREL
B.C.	BRASS CAP
B.C.R.	BEGIN CURB RETURN
B.E.	BRIDGE END
BEG.	BEGIN
BIT.	BITUMINOUS OR BITUMEN
BK.	BACK OR BANK
BLDG.	BUILDING
BLK.	BLOCK
B.L.M.	U.S. BUREAU OF LAND MANAGEMENT
BLVD.	BOULEVARD
B.M.	BENCH MARK
BNDRY.	BOUNDARY
BOT.	BOTTOM
BR.	BRIDGE
B.R.	BASE OF RAIL
BRG.	BEARING
B.S.	BACKSIGHT
B.S.T.	BITUMINOUS SURFACE TREATMENT
B.W.FE.	BARBED WIRE FENCE
C	CUT
C/A	CONTROL OF ACCESS
CALC.	CALCULATED
CAP	CORRUGATED ALUMINUM PIPE
CATV	CABLE TV
CB.	CURB
C.B.	CATCH BASIN
C.B.W.	CONCRETE BLOCK WALL
C.C.	CLOSING CORNER
CDTN.	CONDITION
CEM.	CEMENT
C&G	CURB & GUTTER
CH.	CHANNEL OR CHAIN
CH.CH.	CHANNEL CHANGE
CHD.	CHORD
CHIS. "x"	CHISELED CROSS
C.I.	CURB INLET
CIR.	CIRCLE
CL.	CLASS OR CLEARANCE
CL-1.2F, 1.5F	CHAIN LINK FENCE (W/ HEIGHT)
C/L OR ℄	CENTERLINE
CMP	CORRUGATED METAL PIPE
C.N.	CONCRETE NAIL
CO.	COUNTY OR COMPANY
C.O.	CLEAN OUT
COMP.	COMPACTION
CONC.	CONCRETE
COND. (TEL.)	CONDUIT (SPECIFY TYPE)
CONN.	CONNECTION
CONST.	CONSTRUCTION
COR.	CORNER
CORR.	CORRECTED OR CORRUGATION
COV.	COVER
C.P.	CATCH POINT

CR.	CRUSHED OR CREEK
CRS.	COURSE
CS	CURVE TO SPIRAL
C.S.F.	COMBINATION SCALE FACTOR
CSP	CORRUGATED STEEL PIPE
CSPA	CORRUGATED STEEL PIPE ARCH
CT.	COURT
C.T.B.	CEMENT TREATED BASE
CTR.	CENTER
CTS	CRUSHED TOP SURFACING
CULV.	CULVERT
D	DISTRIBUTION OF TRAFFIC
DBL.	DOUBLE
D.D.	DOWN DRAIN
DE	DIFFERENCE IN ELEVATION
DEFL.	DEFLECTION
DESC.	DESCRIPTION
DEST.	DESTROYED
DET.	DETOUR OR DETAIL
DETC.	DETECTOR
D.H.	DRILL HOLE
D.H.V.	DESIGN HOURLY VOLUME
D.I.	DROP INLET
DIA.	DIAMETER
DIST.	DISTANCE OR DISTRICT
DN.	DOWN
DP.	DEEP
DR.	DRAIN OR DRIVE
DT.	DITCH
DTL.	DETAILED
DWG.	DRAWING
DY.	DAYLIGHT
E	EAST OR EXTERNAL DISTANCE
EB	EASTBOUND
E.C.R.	END CURB RETURN
EDM	ELECTRONIC DISTANCE MEASUREMENT
E.G.	EDGE OF GUTTER
ELEV. OR EL.	ELEVATION
ELONG.	ELONGATED
ELY.	EASTERLY
EMB.	EMBANKMENT
EMUL.	EMULSIFIED
E.O.	EDGE OF OIL
E.P.	EDGE OF PAVEMENT
EQ.	EQUATION
E_s	EXTERNAL DISTANCE (WITH SPIRALS)
E.S.	EDGE OF SHOULDER
ESMT. OR EASE.	EASEMENT
ETW	EDGE OF TRAVELED WAY
EW.	END WALL
EX.	EXISTING
EXC.	EXCAVATION
EXT.	EXTENSION
EXWY.	EXPRESSWAY
F	FILL
F.A.	FEDERAL AID
F.C.	FLOOD CONTROL
FD.	FOUND
FDN.	FOUNDATION
FE.	FENCE
FERT.	FERTILIZER
FETS	FLARED END TERMINAL SECTION
F.G.	FINISHED GRADE
F.G.S.	FINISHED GRADE STAKE

F.H.	FIRE HYDRANT
FIN.	FINISH
FL.	FLUSH
F.L.	FLOW LINE
F.O.	FIBER OPTIC CABLE
F.P.	FENCE POST
FR. RD.	FRONTAGE ROAD
F.S.	FORESIGHT
FTG.	FOOTING
FUT.	FUTURE
FWY.	FREEWAY
g	GRAM
G	GRADING
GA.	GAGE
GALV.	GALVANIZED
GAR.	GARAGE
GEOD.	GEODETIC
G.L.	GAS LINE
G.L.O.	GENERAL LAND OFFICE
GPS	GLOBAL POSITIONING SYSTEM
GR.	GRADE
G.R.	GUARDRAIL
GRND.	GROUND
GR.SEP.	GRADE SEPARATION
G.S.	GRAVEL SURFACING
GSP	GALVANIZED STEEL PIPE
GTR.	GUTTER
G.V.	GAS VALVE
ha	HECTARE
HDWL.	HEADWALL
HG.	HEADGATE
H.I.	HEIGHT OF INSTRUMENT
HO.	HOUSE
HOR.	HORIZONTAL
H.P.	HINGE POINT
HT.	HEIGHT
H&T	HUB & TACK
H.W.	HIGH WATER
HWY.	HIGHWAY
I	INTERSTATE
I.C.	INCIDENTAL CONSTRUCTION
I.D.	INSIDE DIAMETER
I.E.	INVERT ELEVATION
INC.	INCORPORATED OR INCREMENT
INCL.	INCLUDED
INSTR.	INSTRUMENT
INT.	INTERSECTION
INTCH.	INTERCHANGE
INV.	INVERT
I.P.	IRON PIN
IRR.	IRRIGATION
I.R.T.S.	INTERSECTING ROADWAY TERMINAL SECTION
JCT.	JUNCTION
J.P.	JOINT USE POLE
kg	KILOGRAM
km	KILOMETER
L	LENGTH OF CURVE, LITER OR ANGLE IRON
L_c	LENGTH OF CIRCULAR CURVE
L.C.	LONG CHORD
L.D.	LOOP DETECTOR
LENG.	LENGTH OR LENGTHEN
LN.	LANE
L_s	LENGTH OF SPIRAL
L.S.	LAND SURVEYOR
LT.	LEFT
m	METER
m^2	SQUARE METER
m^3	CUBIC METER
mm	MILLIMETER

mm^2	SQUARE MILLIMETER
MATL.	MATERIAL
MAX.	MAXIMUM
MC	MEDIUM CURING
MEAS.	MEASURED
MED.	MEDIAN
MH.	MANHOLE
MIN.	MINIMUM, MINERAL OR MINUTE
MISC.	MISCELLANEOUS
MKR.	MARKER
M.L.	MAINLINE
MNCPL.	MUNICIPAL
M.O.	MID ORDINATE
MON.	MONUMENT
MPC	MID-POINT OF CURVE
N	NORTH
NB	NORTHBOUND
N.C.	NORMAL CROWN
N.E.	NORTHEAST
N.G.	NATURAL GAS
N.G.S.	NATIONAL GEODETIC SURVEY
NL.	NAIL
NLY.	NORTHERLY
NO. OR #	NUMBER
N.W.	NORTHWEST
N.W.EL.	NORMAL WATER ELEVATION
O. OR O/S	OFFSET
O.C.	ON CENTERS OR OVERHEAD CROSSING
O.D.	OUTSIDE DIAMETER
O.G.	OLD GROUND OR ORIGINAL GROUND
OH.	OVERHANG OR OVERHEAD
O'PASS	OVERPASS
P	POWER CABLE OR PIPE
P. OR PG.	PAGE
PAVT.	PAVEMENT
P.B.	PULL BOX
PC	POINT OF CURVE (BEGINNING)
PCC	POINT OF COMPOUND CURVE OR PORTLAND CEMENT CONCRETE
P.C.S.	PROJECT CONTROL SYSTEM
P.E.	PRELIMINARY ENGINEERING
PEN.	PENETRATION
PERF.	PERFORATED
PI	POINT OF INTERSECTION
PL.	PLACE, PLATE OR PLANT
P.L.	PROPERTY LINE
PLAS.	PLASTIC
P.M.	PRINCIPAL MERIDIAN OR PUNCH MARK
P.M.B.	PLANT MIX BASE
P.M.P.	PERFORATED METAL PIPE
PMS	PLANT MIX SURFACING
PMT.	PERMIT
POC	POINT ON CURVE
POL	POINT ON LINE
POS	POINT ON SPIRAL
POST	POINT ON SEMI-TANGENT
POT	POINT ON TANGENT
POVC	POINT ON VERTICAL CURVE
PP	POWER POLE
PP.	PAGES
PREST.	PRESTRESSED
PRIM.	PRIMARY
PROC.	PROCESSING
PROJ.	PROJECT OR PROJECTED

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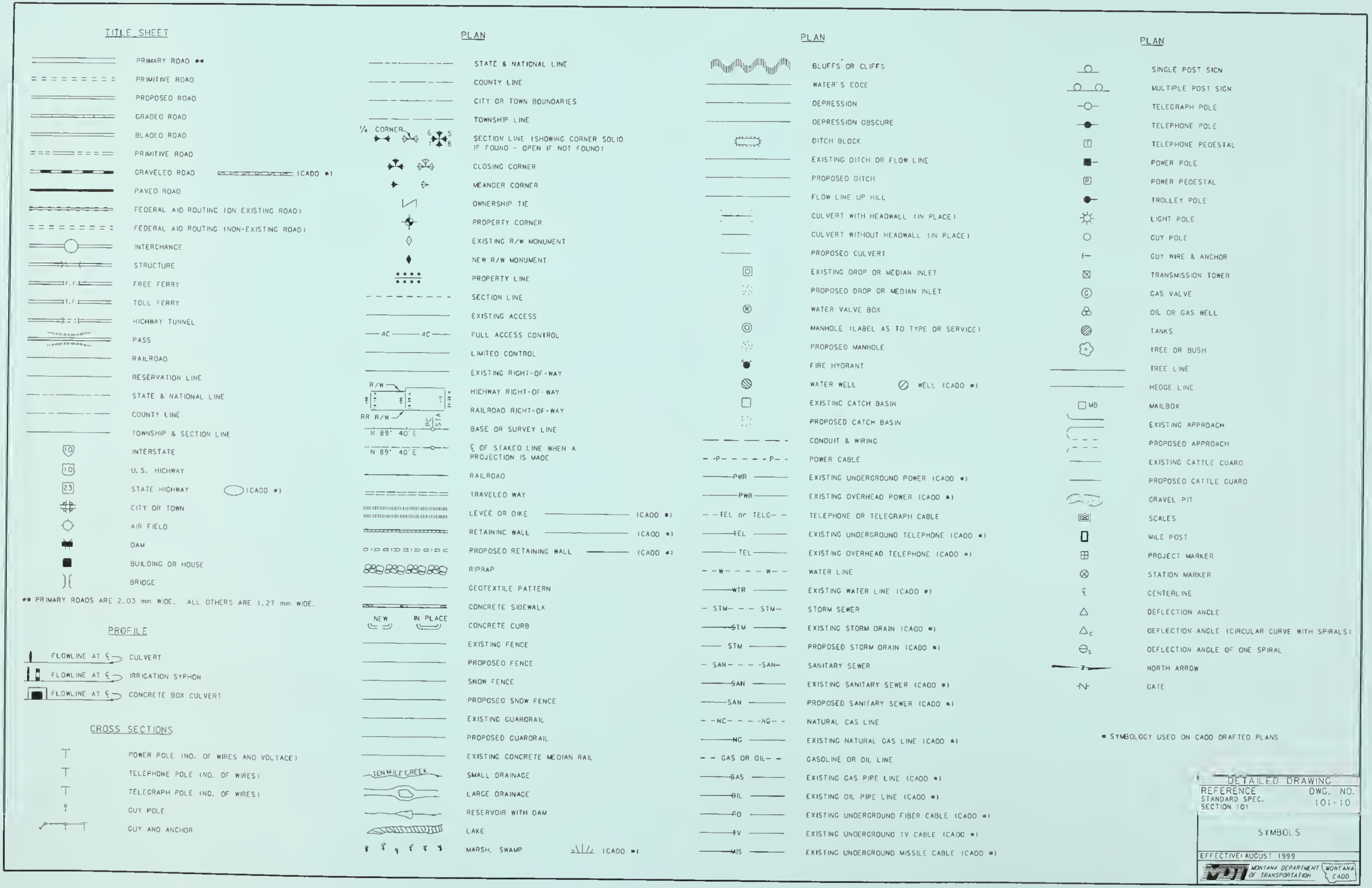
PROT.	PROTECT, PROTECTOR OR PROTECTION
PT	POINT OF TANGENT (END OF CURVE)
PT.	POINT
PTW	PRESENT TRAVELED WAY
PVC	POLYVINYL CHLORIDE
PVT.	PRIVATE
PWR.	POWER (LINES)
Q	PEAK DISCHARGE (WATER)
QTY.	QUANTITY
R	RANGE, RADIUS OR RISE
RACET	ROAD APPROACH CULVERT END TREATMENT
RAD. PT.	RADIUS POINT
R_c	SPIRAL CURVE RADIUS
RC	RAPID CURING
RCB	REINFORCED CONCRETE BOX
RCP	REINFORCED CONCRETE PIPE
RCPA	REINFORCED CONCRETE PIPE ARCH
RD.	ROAD
RDL.	RADIAL
RDWY.	ROADWAY
REC.	RECORD
REF.	REFERENCE
REINF.	REINFORCEMENT
RET. W.	RETAINING WALL
RIV.	RIVER
R. M.	REFERENCE MONUMENT
R. P.	REFERENCE POINT OR REFERENCE POST
R. R.	RAILROAD
RT.	RIGHT OR ROUTE
RTE.	ROUTE
R/W	RIGHT OF WAY
RY.	RAILWAY
S	RATE OF FULL SUPERELEVATION, SPAN OR SOUTH
SA.	SATELLITE (FOR TRAVERSE USE)
SAN.	SANITARY SEWER
SB	SOUTHBOUND
SC	SPIRAL TO CURVE OR SLOW CURING
SCH.	SCHEDULE
SDWK.	SIDEWALK
S. E.	SOUTHEAST
SEC.	SECTION, SECOND OR SECONDARY
SEL.	SELECT
S. G. OR SUBGR.	SUBGRADE
SH.	SHOULDER
SHT.	SHEET
SING.	SINGLE
SIP.	SIPHON
S. L. D.	SEA LEVEL DATUM
SLOT. DR.	SLOTTED DRAIN
SLP. STK.	SLOPE STAKE
SLY.	SOUTHERLY
S. P.	STAND PIPE OR STATE PLANE
SPEC. PROV.	SPECIAL PROVISION
S. P. H. P.	STEEL PIPE, HIGH PRESSURE
SPK.	SPIKE
SQ.	SQUARE
SS	EMULSIFIED ASPHALT
SSPP	STRUCTURAL STEEL PLATE PIPE
SSPPA	STRUCTURAL STEEL PLATE PIPE ARCH
ST	SPIRAL TO TANGENT
ST.	STREET
STA.	STATION
STD.	STANDARD
SPEC.	SPECIFICATION
STK.	STAKED OR STAKE
STL.	STEEL
STM.	STORM DRAIN
STPD.	STAMPED
STR.	STRUCTURE OR STRAIGHT
SUBD.	SUBDIVISION
SURF.	SURFACE OR SURFACING
SURV.	SURVEY
S. W.	SOUTHWEST OR SIDEWALK
t	METRIC TON
T	TOWNSHIP, TANGENT LENGTH OR PERCENT TRUCKS
TAN.	TANGENT
T. B. C.	TOP BACK OF CURB
T. B. M.	TEMPORARY BENCH MARK
TBR.	TIMBER
TEL.	TELEPHONE
TEL. C.	TELEPHONE CABLE
TELG.	TELEGRAPH
TEL. P.	TELEPHONE POLE
TEMP.	TEMPERATURE OR TEMPORARY
THK.	THICKNESS
TK.	TACK
TOPOG.	TOPOGRAPHIC
T. P.	TURNING POINT
TR.	TRACT
TRANS.	TRANSMISSION LINE OR TRANSITION
TRAV.	TRAVERSE
TRIA.	TRIANGULATION
T_s	LENGTH OF TANGENT (CURVE WITH SPIRALS)
TS	TANGENT TO SPIRAL
TT	TRANSMISSION TOWER
TYP.	TYPICAL
U	UNIT
U. G.	UNDERGROUND
UNCL.	UNCLASSIFIED
U' PASS	UNDERPASS
U. S. C. & G. S.	U. S. COAST & GEODETIC SURVEY
U. S. C. E.	U. S. CORPS OF ENGINEERS
U. S. F. S.	U. S. FOREST SERVICE
U. S. G. S.	U. S. GEOLOGICAL SURVEY
U. S. P. L. S.	U. S. PUBLIC LAND SURVEY
V	DESIGN SPEED OR VELOCITY
V. A. B. M.	VERTICAL ANGLE BENCH MARK
VC	VERTICAL CURVE
VC CORR.	VERTICAL CURVE OFFSET CORRECTION
V. C. M.	VERTICAL CONTROL MONUMENT
V. C. P.	VITRIFIED CLAY PIPE
VEH.	VEHICULAR
VERT. OR VT.	VERTICAL
VIT.	VITRIFIED
V. P.	VENT PIPE
VPC	VERTICAL POINT OF CURVE
VPI	VERTICAL POINT OF INTERSECTION
VPT	VERTICAL POINT OF TANGENCY
W	WEST
W/	WITH
WB	WESTBOUND
W. C.	WITNESS CORNER
W. L.	WATER LINE
WLY.	WESTERLY
W/O	WITHOUT
W. P.	WING POINT
W. S.	WATER SERVICE OR WARPED OR VARIABLE SLOPE
WT.	WEIGHT
W. T.	WATER TABLE
W. V.	WATER VALVE
W. W.	WING WALL OR WOVEN WIRE
XING.	CROSSING
XSEC.	CROSS-SECTION



TITLE SHEET

- PRIMARY ROAD **
- PRIMITIVE ROAD
- PROPOSED ROAD
- GRADED ROAD
- BLADED ROAD
- PRIMITIVE ROAD
- GRAVELED ROAD (CADD *)
- PAVED ROAD
- FEDERAL AID ROUTING (ON EXISTING ROAD)
- FEDERAL AID ROUTING (NON-EXISTING ROAD)
- INTERCHANGE
- STRUCTURE
- FREE FERRY
- TOLL FERRY
- HIGHWAY TUNNEL
- PASS
- RAILROAD
- RESERVATION LINE
- STATE & NATIONAL LINE
- COUNTY LINE
- TOWNSHIP & SECTION LINE
- INTERSTATE
- U. S. HIGHWAY
- STATE HIGHWAY (CADD *)
- CITY OR TOWN
- AIR FIELD
- DAM
- BUILDING OR HOUSE
- BRIDGE

** PRIMARY ROADS ARE 2.03 mm WIDE. ALL OTHERS ARE 1.27 mm WIDE.

PROFILE

- FLOWLINE AT ℄ CULVERT
- FLOWLINE AT ℄ IRRIGATION SYPHON
- FLOWLINE AT ℄ CONCRETE BOX CULVERT

CROSS SECTIONS

- POWER POLE (NO. OF WIRES AND VOLTAGE)
- TELEPHONE POLE (NO. OF WIRES)
- TELEGRAPH POLE (NO. OF WIRES)
- GUY POLE
- GUY AND ANCHOR

PLAN

- STATE & NATIONAL LINE
- COUNTY LINE
- CITY OR TOWN BOUNDARIES
- TOWNSHIP LINE
- SECTION LINE (SHOWING CORNER SOLID IF FOUND - OPEN IF NOT FOUND)
- CLOSING CORNER
- MEANDER CORNER
- OWNERSHIP TIE
- PROPERTY CORNER
- EXISTING R/W MONUMENT
- NEW R/W MONUMENT
- PROPERTY LINE
- SECTION LINE
- EXISTING ACCESS
- FULL ACCESS CONTROL
- LIMITED CONTROL
- EXISTING RIGHT-OF-WAY
- HIGHWAY RIGHT-OF-WAY
- RAILROAD RIGHT-OF-WAY
- BASE OR SURVEY LINE
- ℄ OF STAKED LINE WHEN A PROJECTION IS MADE
- RAILROAD
- TRAVELED WAY
- LEVEE OR DIKE (CADD *)
- RETAINING WALL (CADD *)
- PROPOSED RETAINING WALL (CADD *)
- RIPRAP
- GEOTEXTILE PATTERN
- CONCRETE SIDEWALK
- CONCRETE CURB
- EXISTING FENCE
- PROPOSED FENCE
- SNOW FENCE
- PROPOSED SNOW FENCE
- EXISTING GUARDRAIL
- PROPOSED GUARDRAIL
- EXISTING CONCRETE MEDIAN RAIL
- SMALL DRAINAGE
- LARGE DRAINAGE
- RESERVOIR WITH DAM
- LAKE
- MARSH, SWAMP (CADD *)

PLAN

- BLUFFS OR CLIFFS
- WATER'S EDGE
- DEPRESSION
- DEPRESSION OBSCURE
- DITCH BLOCK
- EXISTING DITCH OR FLOW LINE
- PROPOSED DITCH
- FLOW LINE UP HILL
- CULVERT WITH HEADWALL (IN PLACE)
- CULVERT WITHOUT HEADWALL (IN PLACE)
- PROPOSED CULVERT
- EXISTING DROP OR MEDIAN INLET
- PROPOSED DROP OR MEDIAN INLET
- WATER VALVE BOX
- MANHOLE (LABEL AS TO TYPE OR SERVICE)
- PROPOSED MANHOLE
- FIRE HYDRANT
- WATER WELL
- WELL (CADD *)
- EXISTING CATCH BASIN
- PROPOSED CATCH BASIN
- CONDUIT & WIRING
- POWER CABLE
- EXISTING UNDERGROUND POWER (CADD *)
- EXISTING OVERHEAD POWER (CADD *)
- TELEPHONE OR TELEGRAPH CABLE
- EXISTING UNDERGROUND TELEPHONE (CADD *)
- EXISTING OVERHEAD TELEPHONE (CADD *)
- WATER LINE
- EXISTING WATER LINE (CADD *)
- STORM SEWER
- EXISTING STORM DRAIN (CADD *)
- PROPOSED STORM DRAIN (CADD *)
- SANITARY SEWER
- EXISTING SANITARY SEWER (CADD *)
- PROPOSED SANITARY SEWER (CADD *)
- NATURAL GAS LINE
- EXISTING NATURAL GAS LINE (CADD *)
- GASOLINE OR OIL LINE
- EXISTING GAS PIPE LINE (CADD *)
- EXISTING OIL PIPE LINE (CADD *)
- EXISTING UNDERGROUND FIBER CABLE (CADD *)
- EXISTING UNDERGROUND TV CABLE (CADD *)
- EXISTING UNDERGROUND MISSILE CABLE (CADD *)

PLAN

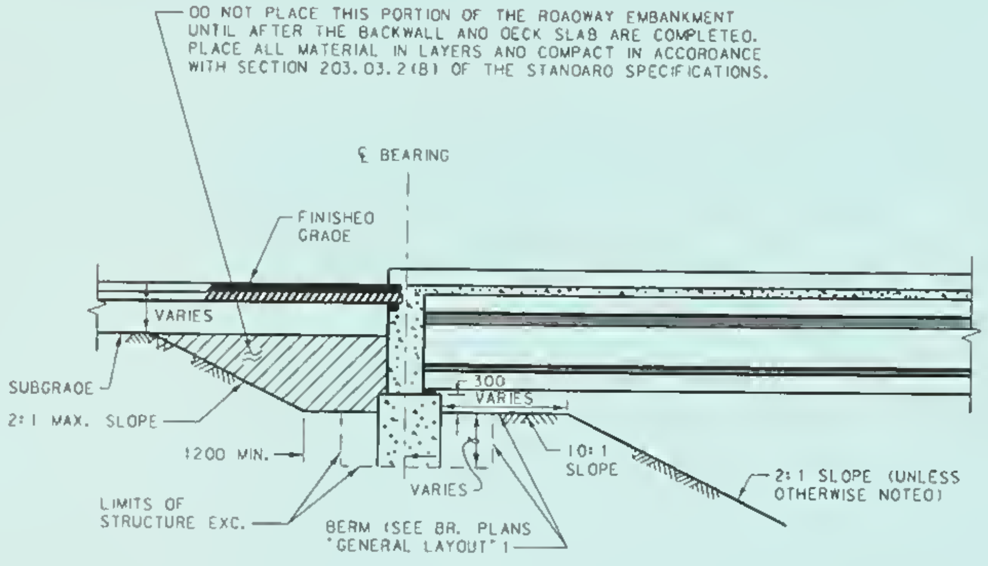
- SINGLE POST SIGN
- MULTIPLE POST SIGN
- TELEGRAPH POLE
- TELEPHONE POLE
- TELEPHONE PEDESTAL
- POWER POLE
- POWER PEDESTAL
- TROLLEY POLE
- LIGHT POLE
- GUY POLE
- GUY WIRE & ANCHOR
- TRANSMISSION TOWER
- GAS VALVE
- OIL OR GAS WELL
- TANKS
- TREE OR BUSH
- TREE LINE
- HEDGE LINE
- MAILBOX
- EXISTING APPROACH
- PROPOSED APPROACH
- EXISTING CATTLE GUARD
- PROPOSED CATTLE GUARD
- GRAVEL PIT
- SCALES
- MILE POST
- PROJECT MARKER
- STATION MARKER
- CENTERLINE
- DEFLECTION ANGLE
- DEFLECTION ANGLE (CIRCULAR CURVE WITH SPIRALS)
- DEFLECTION ANGLE OF ONE SPIRAL
- NORTH ARROW
- GATE

* SYMBOLOGY USED ON CADD DRAFTED PLANS

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 101
DWG. NO.
101-10

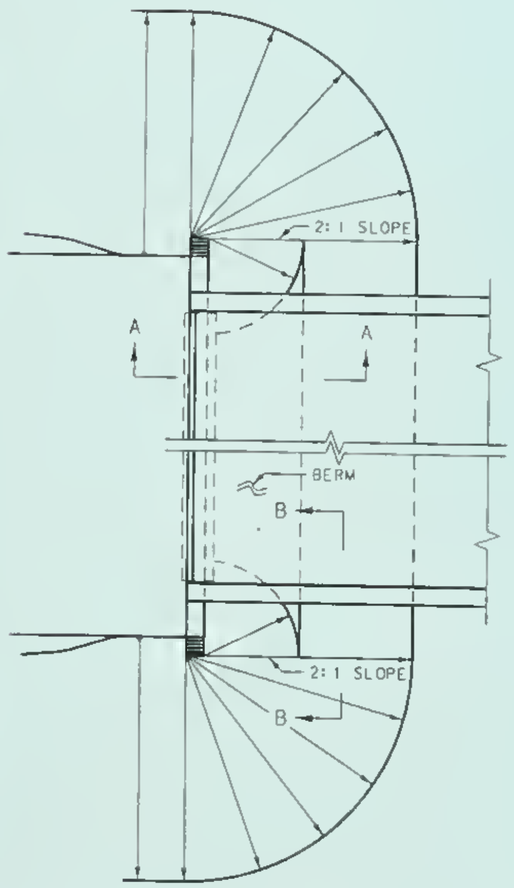
SYMBOLS

EFFECTIVE: AUGUST 1999
MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

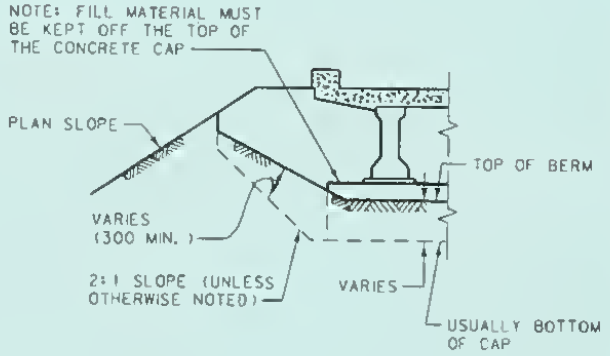


DO NOT PLACE THIS PORTION OF THE ROADWAY EMBANKMENT UNTIL AFTER THE BACKWALL AND DECK SLAB ARE COMPLETED. PLACE ALL MATERIAL IN LAYERS AND COMPACT IN ACCORDANCE WITH SECTION 203.03.2(B) OF THE STANDARD SPECIFICATIONS.

SECTION A-A



PLAN VIEW



NOTE: FILL MATERIAL MUST BE KEPT OFF THE TOP OF THE CONCRETE CAP

SECTION B-B

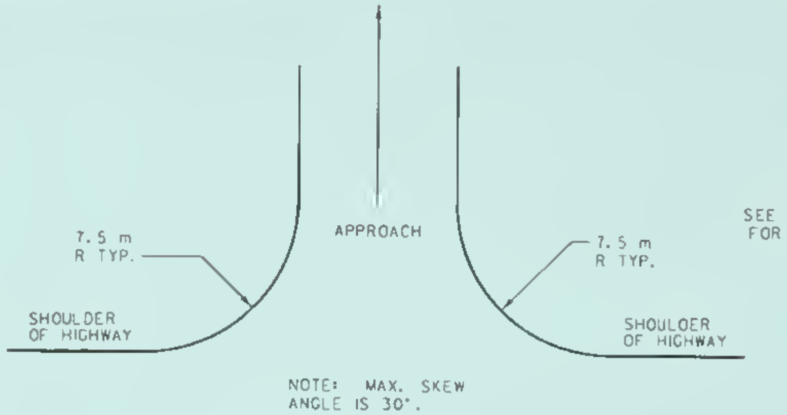
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 203
DWG. NO.
203-00

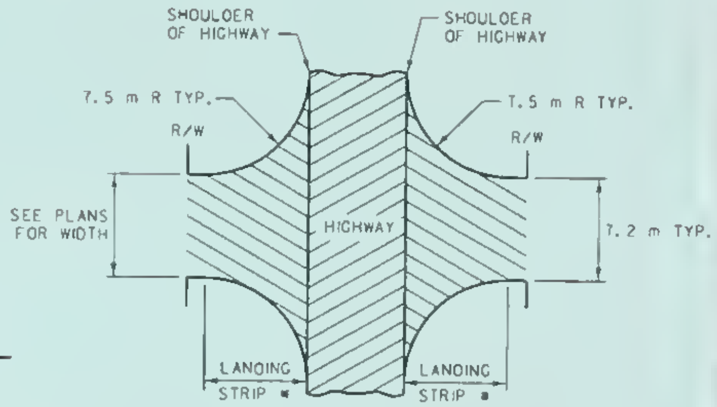
ROADWAY EMBANKMENT
AT BRIDGE END

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

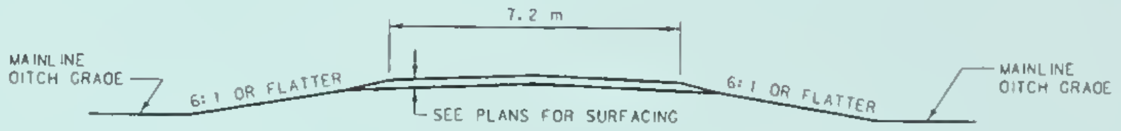


NOTE: MAX. SKEW ANGLE IS 30°.



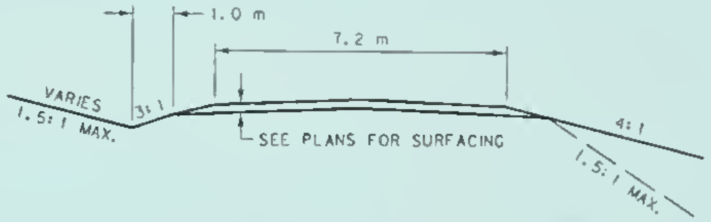
* 7.5 m MIN. FOR PRIVATE OR FIELD APP. 25.0 m MIN FOR COUNTY AND MAIN ROADS.

SLOPE FOR DRAINAGE (-3% DESIRABLE, +3% ALLOWABLE).



TYPICAL SECTION WITHIN CLEAR ZONE

USE A PIPE AS NECESSARY FOR DRAINAGE. INSTALL CULVERTS OUTSIDE THE CLEAR ZONE OR PROVIDE END TREATMENT.



TYPICAL SECTION BEYOND CLEAR ZONE

BACK SLOPES **	
0 - 1.5 m	4:1
1.5 m - 3.0 m	2:1
OVER 3.0 m	1.5:1

FILL SLOPES **	
0 - 3.0 m	4:1
3.0 m - 6.0 m	2:1
OVER 6.0 m	1.5:1

NOTES:

APPROACH GRADE BEYOND LANDING IS NOT TO EXCEED 10% UNLESS TRAFFIC VOLUMES AND COST INDICATE SUCH TO BE JUSTIFIABLE.

CONSTRUCT APPROACHES TO FIT LOCAL CONDITIONS. MINIMIZE TRAFFIC HAZARDS, AND AFFORD ENTRY AND EXIT OF TRAFFIC TO AND FROM THE MAIN ROAD.

SECURE WRITTEN PERMISSION FROM LANDOWNER FOR WORK BEYOND THE RIGHT-OF-WAY.

** CRITERIA SHOWN ARE FOR PRIVATE AND FARM FIELD APPROACHES. FOR COUNTY AND MAIN ROADS USE ESTABLISHED STANDARDS FOR APPLICABLE FUNCTIONAL CLASS.

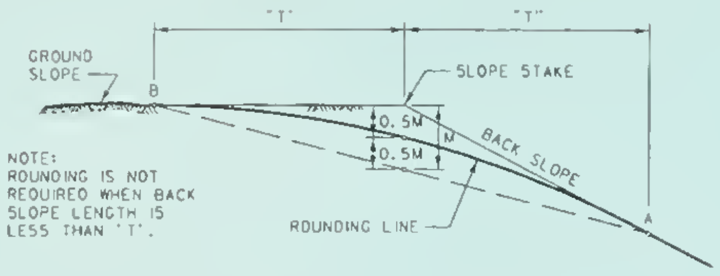
DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 203
DWG. NO.
203-05

APPROACHES

EFFECTIVE: AUGUST 1999

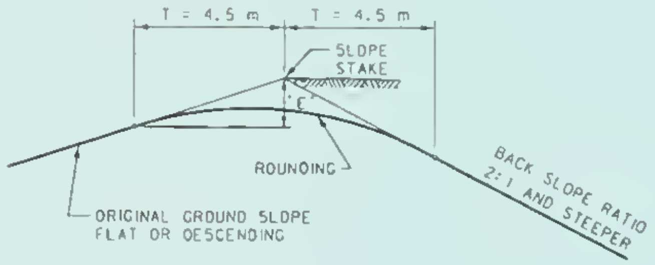
MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

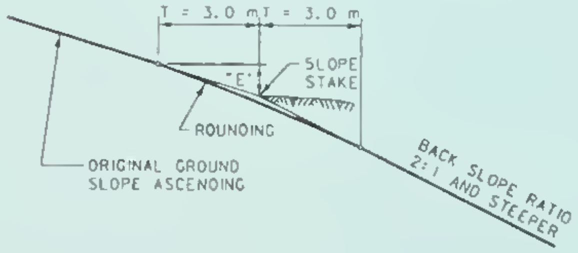
VERTICAL OFFSETS FROM ROADWAY AND GROUND SLOPES TO ROUNDING LINES FOR CUTS



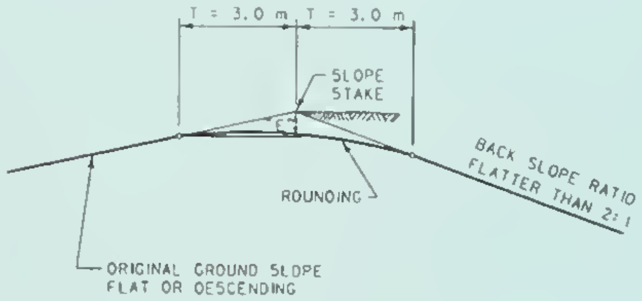
NOTE:
ROUNDING IS NOT REQUIRED WHEN BACK SLOPE LENGTH IS LESS THAN 'T'.

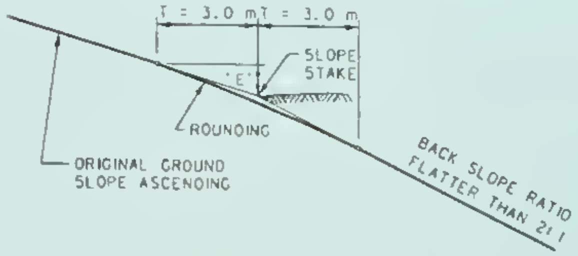
BACK SLOPES 2:1 AND STEEPER


T = 4.5 m
T = 4.5 m
SLOPE STAKE
"E"
ROUNDING
ORIGINAL GROUND SLOPE FLAT OR DESCENDING
BACK SLOPE RATIO 2:1 AND STEEPER


T = 3.0 m
T = 3.0 m
SLOPE STAKE
"E"
ROUNDING
ORIGINAL GROUND SLOPE ASCENDING
BACK SLOPE RATIO 2:1 AND STEEPER

BACK SLOPES FLATTER THAN 2:1


T = 3.0 m
T = 3.0 m
SLOPE STAKE
"E"
ROUNDING
ORIGINAL GROUND SLOPE FLAT OR DESCENDING
BACK SLOPE RATIO FLATTER THAN 2:1


T = 3.0 m
T = 3.0 m
SLOPE STAKE
"E"
ROUNDING
ORIGINAL GROUND SLOPE ASCENDING
BACK SLOPE RATIO FLATTER THAN 2:1

BACK SLOPES
2:1 AND STEEPER (T = 4.5 m)

VERT. DIST. "E" (m)	DESCENDING GROUND CUTS					
	0.5M (m)					
	0.75:1	1:1	1.25:1	1.5:1	1.75:1	2:1
FLAT	1.50	1.15	0.90	0.75	0.65	0.55
0.6	1.65	1.30	1.05	0.90	0.80	0.70
1.2	1.80	1.45	1.20	1.05	0.95	0.85
1.8	1.95	1.60	1.35	1.20	1.10	1.00
2.4	2.10	1.75	1.50	1.35	1.25	1.15
3.0	2.25	1.90	1.65	1.50	1.40	1.30
3.6	2.40	2.05	1.80	1.65	1.55	1.45
4.2	2.55	2.20	1.95	1.80	1.70	1.60
4.8	2.70	2.35	2.10	1.95	1.85	1.75

BACK SLOPES
2:1 AND STEEPER (T = 3.0 m)

VERT. DIST. "E" (m)	ASCENDING GROUND CUTS					
	0.5M (m)					
	0.75:1	1:1	1.25:1	1.5:1	1.75:1	2:1
FLAT	1.00	0.75	0.60	0.50	0.45	0.40
0.6	0.85	0.60	0.45	0.35	0.30	0.25
1.2	0.70	0.45	0.30	0.20	0.15	0.10
1.8	0.55	0.30	0.15	0.05	0.00	0.00
2.4	0.40	0.15	0.00	0.00	~	~
3.0	0.25	0.00	~	~	~	~
3.6	0.10	~	~	~	~	~
4.2	0.00	~	~	~	~	~

BACK SLOPES
FLATTER THAN 2:1 (T = 3.0 m)

VERT. DIST. "E" (m)	DESCENDING GROUND CUTS					
	0.5M (m)					
	2.5:1	3:1	3.5:1	4:1	5:1	6:1
FLAT	0.30	0.25	0.20	0.20	0.15	0.15
0.3	0.40	0.35	0.30	0.25	0.25	0.20
0.6	0.45	0.40	0.35	0.35	0.30	0.30
0.9	0.55	0.50	0.45	0.40	0.40	0.35
1.2	0.60	0.55	0.50	0.50	0.45	0.45
1.5	0.70	0.65	0.60	0.55	0.55	0.50
1.8	0.75	0.70	0.65	0.65	0.60	0.60
2.1	0.85	0.80	0.75	0.70	0.70	0.65
2.4	0.90	0.85	0.80	0.80	0.75	0.75
2.7	1.00	0.95	0.90	0.85	0.85	0.80
3.0	1.05	1.00	0.95	0.95	0.90	0.90

BACK SLOPES
FLATTER THAN 2:1 (T = 3.0 m)

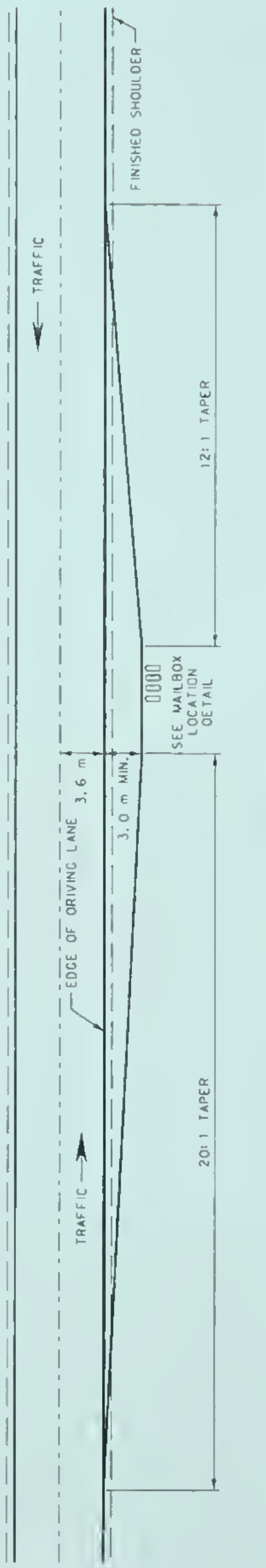
VERT. DIST. "E" (m)	ASCENDING GROUND CUTS					
	0.5M (m)					
	2.5:1	3:1	3.5:1	4:1	5:1	6:1
FLAT	0.30	0.25	0.20	0.20	0.15	0.15
0.3	0.25	0.20	0.15	0.10	0.10	0.05
0.6	0.15	0.10	0.05	0.05	0.00	0.00
0.9	0.10	0.05	0.00	0.00	~	~
1.2	0.00	0.00	~	~	~	~
1.5	~	~	~	~	~	~
1.8	~	~	~	~	~	~
2.1	~	~	~	~	~	~
2.4	~	~	~	~	~	~
2.7	~	~	~	~	~	~
3.0	~	~	~	~	~	~

DETAILED DRAWING
REFERENCE DWG. NO.
STANDARD SPEC.
SECTION 203 203-10

SLOPE ROUNDING

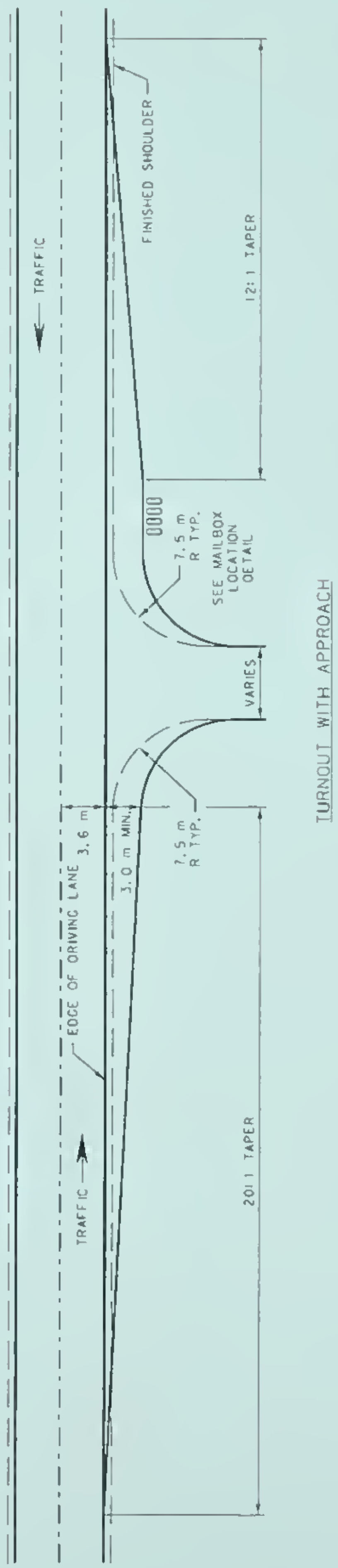
EFFECTIVE: AUGUST 1995

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



NOTE:
ACTUAL SIZE AND LOCATION TO BE DETERMINED BY THE ENGINEER.

TURNOUT WITHOUT APPROACH



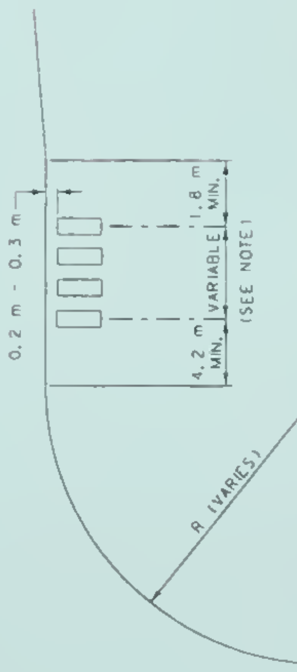
TURNOUT WITH APPROACH

NOTES:

LOCATE NEW INSTALLATIONS, IF POSSIBLE, ON THE FAR RIGHT SIDE OF AN INTERSECTION WITH A PUBLIC ROAD OR PRIVATE DRIVEWAY.

APPROACH QUANTITIES ARE NOT INCLUDED IN TURNOUT QUANTITIES.

USE THIS DETAIL FOR ALL ROADS AND ADT. FOR ADT LESS THAN 400, STEEPER TAPERS ARE ALLOWED IF NEEDED DUE TO LIMITATIONS. SEE THE "AASHTO GUIDE FOR ERECTING MAILBOXES ON HIGHWAYS."



NOTE:
THE MINIMUM SPACING BETWEEN MAILBOXES IS EQUAL TO THREE-FOURTHS OF THEIR HEIGHT ABOVE THE GROUND. SEE DTL. DWG. NO. 900-05 AND 900-10 FOR MAILBOX DETAILS.

MAILBOX LOCATION DETAIL

DETAILED DRAWING
REFERENCE DWG. NO.
STANDARD SPEC.
SECTION 203 203-15

MAILBOX TURNOUT

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

EROSION CONTROL SYMBOLS

BEST MANAGEMENT PRACTICE (BMP)	NAME	SYMBOL	DTL. DWG. NO.
SLOPE ROUGHENING	P-01	SR	208-05
STEPPED SLOPE	P-02	SS	208-07
TEMPORARY SEEDING	P-03	TS	208-10
EROSION SEEDING	P-04	ES	208-15
RUN-ON DIVERSION/CONTROL	P-05	RD	208-20
SLOPE DRAINS	P-06	SD	208-25
EROSION MAT	P-07	EM	208-30
DITCH SEDIMENT TRAPS	R-01	DT#	208-35
DUGOUT DITCH BASIN	R-02	DDB	208-40
GRAVEL FILTER BERM	R-03	GFB	208-45
SEDIMENT CONTROL FENCE	R-04	SCF	208-50
STRAW BALE BARRIER	R-05	SBB	208-55
VEGETATIVE BUFFER STRIP	R-06	VBS	208-60
RUNOFF INTERCEPTION DITCH	R-07	RID	208-65
PIPE INLET/OUTLET PROTECTION	R-08	I/O	208-70
WATERWAY PROTECTION	W-01	WP	208-75
WATER RESOURCE PROTECTION	W-02	WR	208-80

DETAILED DRAWING
REFERENCE DWG. NO.
STANDARD SPEC.
SECTION 208 208-00

EROSION CONTROL
SYMBOLS

EFFECTIVE: AUGUST 1999

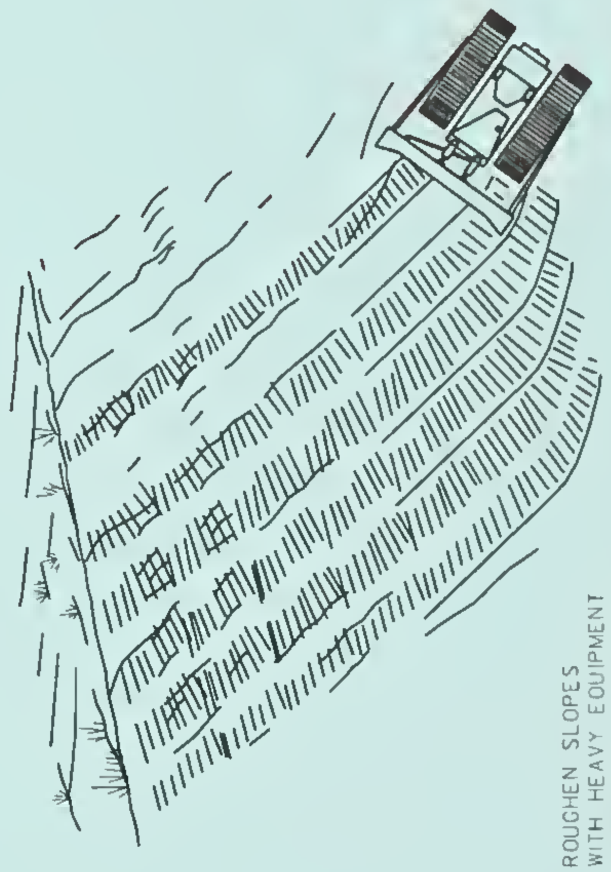
MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

SYMBOL: SR

SLOPE ROUGHENING BMP P-01:

SLOPE ROUGHENING (SR) IS A VERY ROUGH SOIL SURFACE ON SLOPES RESULTING FROM CONSTRUCTION ACTIVITIES OR THE SYSTEMATIC ROUGHENING USING HEAVY EQUIPMENT TO CREATE RIDGES OR FURROWS PERPENDICULAR TO THE SLOPE. THE RIDGES OR FURROWS ARE TO BE EQUAL TO OR GREATER THAN 50 mm IN HEIGHT AND NO FURTHER THAN TWICE THE HEIGHT OF THE RIDGE OR FURROW APART. SLOPE ROUGHENING IS THE BEST FIRST LINE OF DEFENSE TO CONTROL EROSION AND SEDIMENT RUNOFF. DEGREE OF SLOPE ROUGHENING IS DEPENDENT ON THE GRADES AND PROXIMITY TO WATER RESOURCES.

ALL SLOPES STEEPER THAN 3:1 AND GREATER THAN 1500 VERTICAL MILLIMETERS REQUIRE SLOPE ROUGHENING, EXCLUDING ROCK SLOPES THAT CANNOT BE EXCAVATED BY RIPPING. ROUGHEN DISTURBED SLOPES OR LEAVE IN A ROUGHENED CONDITION. APPROPRIATE SUPPLEMENTS INCLUDE TEMPORARY SEEDING OR EROSION SEEDING. WHEN FILL SLOPES ARE WITHIN 15 METERS OF SURFACE WATER, A SEDIMENT RETENTION BMP IS REQUIRED: EITHER SEDIMENT CONTROL FENCES OR RUNOFF INTERCEPTION DITCHES.



ROUGHEN SLOPES WITH HEAVY EQUIPMENT OR LEAVE IN ROUGHENED CONDITION

DETAILED DRAWING
REFERENCE DWG. NO.
STANDARD SPEC.
SECTION 208 208-05

SLOPE ROUGHENING
(P-01)

EFFECTIVE: AUGUST 1999

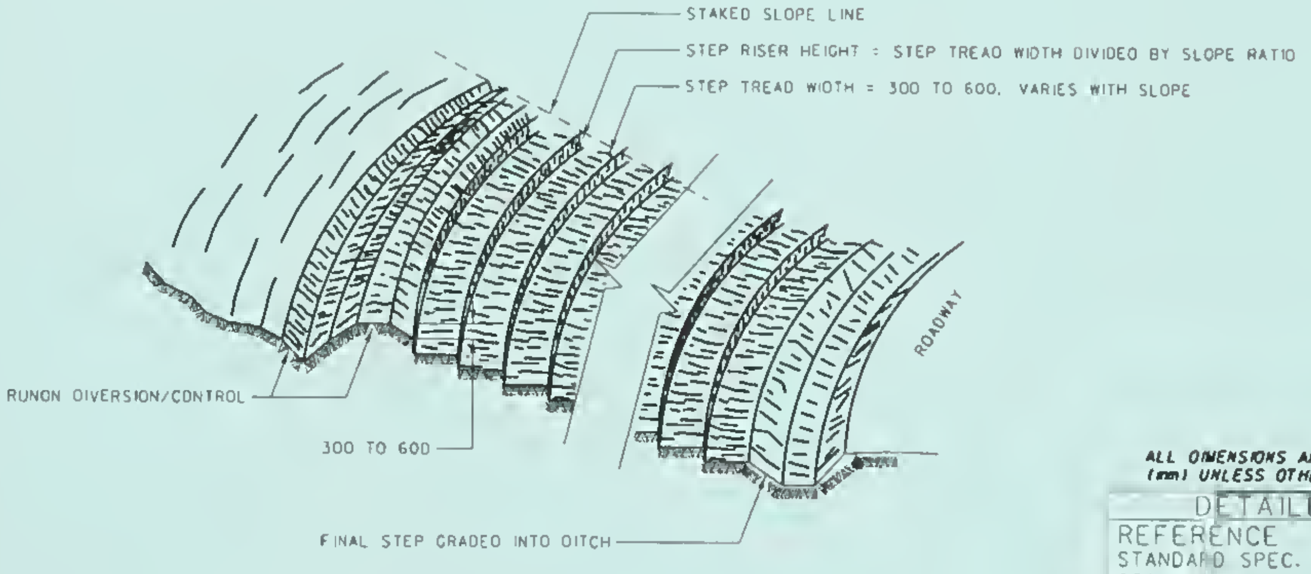
MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

SYMBOL: ←—(SS)—→

STEPPED SLOPE BMP P-02:

STEPPED SLOPE (SS) IS A VERY ROUGH SOIL SURFACE ON SLOPES WITH HORIZONTAL DEPRESSIONS/STAIR STEPPING CUTS OR TERRACES CREATED BY APPROPRIATE MACHINERY. THE USE OF THIS BMP IS TO BE DETERMINED BY THE ENGINEER.

WHEN POSSIBLE, HORIZONTALLY STEP ALL CUT SLOPES 2:1 AND STEEPER. EXCLUDING ROCK SLOPES THAT CANNOT BE EXCAVATED BY RIPPING. STEP SLOPES AT THE DISCRETION OF THE ENGINEER AND IN ACCORDANCE WITH MDT STANDARD SPECIFICATIONS 208 AND 203.03.1F.


STAKED SLOPE LINE
STEP RISER HEIGHT = STEP TREAD WIDTH DIVIDED BY SLOPE RATIO
STEP TREAD WIDTH = 300 TO 600. VARIES WITH SLOPE
ROADWAY
RUNON DIVERSION/CONTROL
300 TO 600
FINAL STEP GRADED INTO DITCH

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 208
DWG. NO.
208-07

STEPPED SLOPE
(P-02)

EFFECTIVE: AUGUST 1999

MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

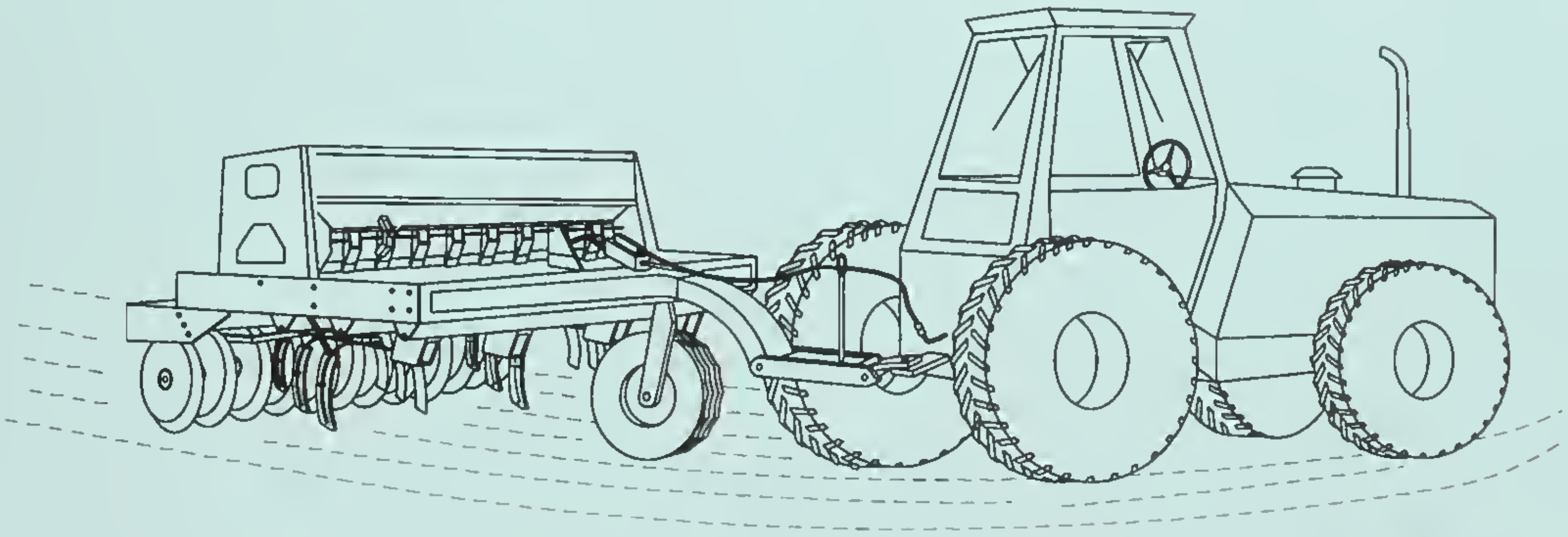
SYMBOL: ←—(TS)—→

TEMPORARY SEEDING BMP P-03:

TEMPORARY SEEDING (TS) IS THE ESTABLISHMENT OF A TEMPORARY VEGETATIVE COVER BY SEEDING WITH CEREAL BARLEY. USE TEMPORARY SEEDING ON AREAS 3:1 OR FLATTER THAT WILL BE EXPOSED FOR LONGER THAN 14 DAYS AND THAT WILL UNDERGO FURTHER DISTURBANCE. EXCLUDING ROCK SLOPES THAT CANNOT BE EXCAVATED BY RIPPING.

SEEDING DATES AND APPLICATION RATES ARE AS FOLLOWS:
APR. 1 TO JUN. 30: CEREAL BARLEY AT 13.5 kg/ha
JUL. 1 TO AUG. 31: TEMPORARY SEEDING NOT RECOMMENDED
SEP. 1 TO NOV. 15: CEREAL BARLEY AT 13.5 kg/ha (DO NOT TEMPORARY SEED IN THIS TIMEFRAME IF THE AREA IS TO BE PERMANENTLY SEEDED THAT FALL.)

CONTACT THE MDT AGRONOMIST PRIOR TO USING SUBSTITUTIONS OR PLACING TEMPORARY SEEDING OUTSIDE THESE DATES. DRILL SEED SLOPES OF 3:1 OR FLATTER. FOR SLOPES STEEPER THAN 3:1, REFER TO EROSION SEEDING.



SLOPES 3:1 OR FLATTER

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 208
DWG. NO.
208-10

TEMPORARY SEEDING
(P-03)

EFFECTIVE: AUGUST 1999

MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

SYMBOL: ES

EROSION SEEDING BMP P-04:

EROSION SEEDING (ES) IS THE IMMEDIATE SEEDING OF FRESHLY EXPOSED SLOPES. USE EROSION SEEDING ON CUT AND FILL SLOPES STEEPER THAN 3:1 THAT WILL NOT UNDERGO FURTHER DISTURBANCE. EXCLUDING ROCK SLOPES THAT CANNOT BE EXCAVATED BY RIPPING. THIS SEEDING WILL NOT REPLACE OR SUBSTITUTE FOR FINAL SEEDING ACTIVITIES SPECIFIED IN THE SEEDING SPECIAL PROVISION.

SEED COMPLETED SECTIONS DAILY. REGARDLESS OF THE TIME OF YEAR. ACCOMPLISH SEEDING BY MANUAL BROADCASTING WITH A SHOULDER-HARNESSED SPREADER SEEDER OR ITS EQUIVALENT WITH NO MULCH OR FERTILIZER APPLIED. STORE THE RECOMMENDED SEED MIX ON-SITE PRIOR TO INITIATION OF SLOPE EXCAVATION. IF ONE OR MORE SPECIES IS UNAVAILABLE. CONTACT THE MDT AGRONOMIST FOR THE SUBSTITUTE. THE SEED MIX AND RATE OF APPLICATION ARE AS FOLLOWS:

DISTRICT	SPECIES	kg/ha PLS
1 (MISSOULA)	CANADA WILDRYE	3.5
	SECAR BLUEBUNCH WHEATGRASS	5.5
	CRITANA THICKSPIKE WHEATGRASS	5.5
	COVAR SHEEP FESCUE	2.0
	CEREAL BARLEY	5.5
2. 3. 5 (BUTTE. GREAT FALLS. BILLINGS)	CANADA WILDRYE	3.5
	SECAR BLUEBUNCH WHEATGRASS	5.5
	SODAR STREAMBANK WHEATGRASS	5.5
	COVAR SHEEP FESCUE	2.0
	CEREAL BARLEY	5.5
4 (GLENDIVE)	CANADA WILDRYE	3.5
	SECAR BLUEBUNCH WHEATGRASS	5.5
	ROSANA WESTERN WHEATGRASS	5.5
	LODORM GREEN NEEDLEGRASS	3.5
	CEREAL BARLEY	5.5

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 208
DWG. NO.
208-15

EROSION SEEDING
(P-04)

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

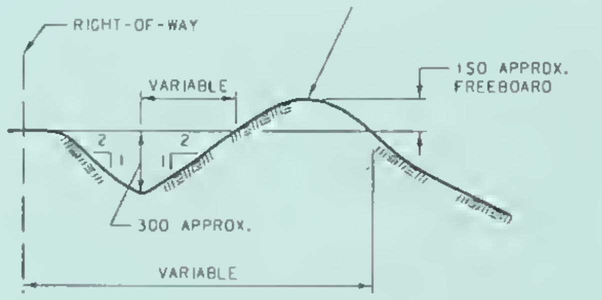
SYMBOL: RD

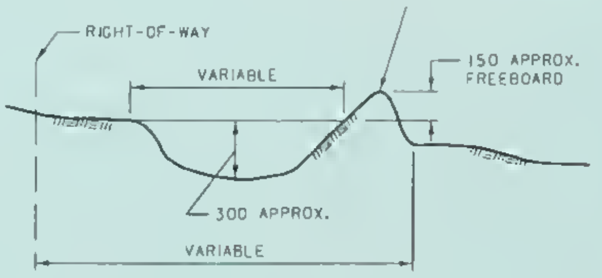
RUN-ON DIVERSION/CONTROL BMP P-05:

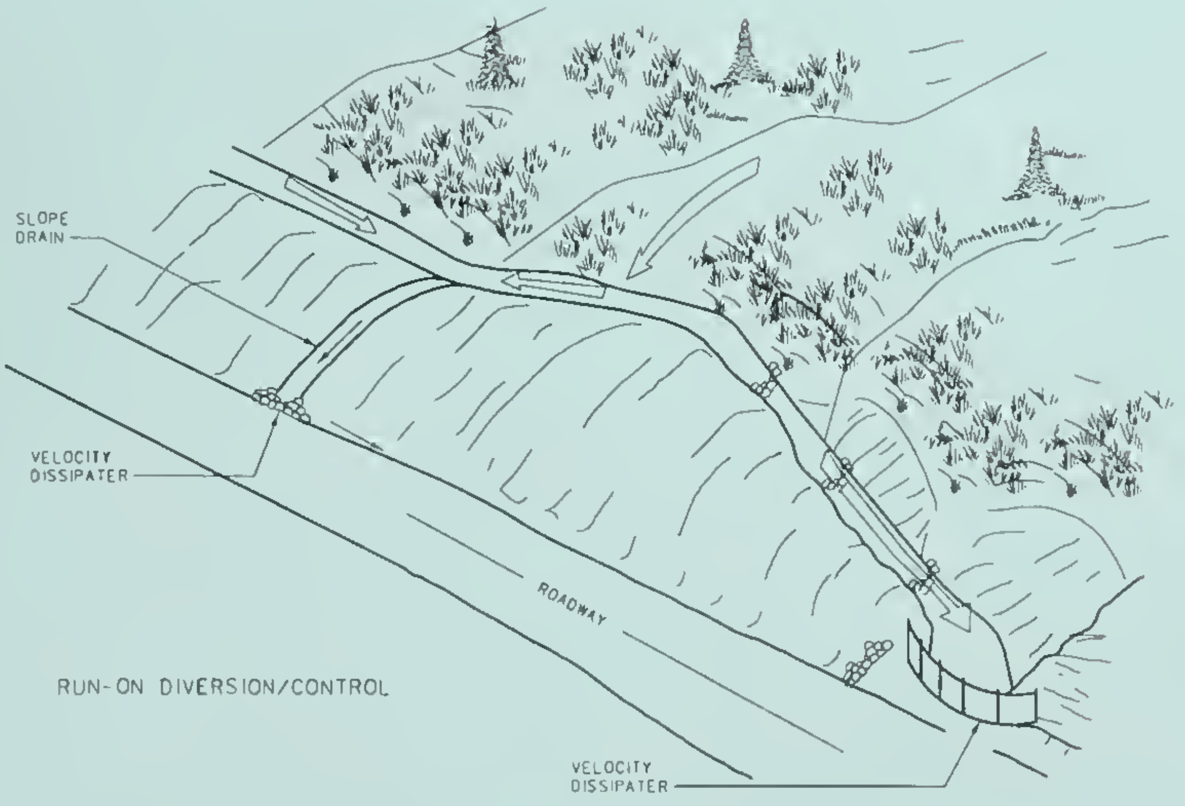
RUN-ON DIVERSION/CONTROL (RD) IS A BERM OF COMPACTED SOIL AND/OR A DITCH ON TOP OF CUT SLOPES TO INTERCEPT STORM WATER RUNOFF FROM THE DRAINAGE AREA ABOVE THE UNPROTECTED SLOPES AND DIRECT IT TO A STABILIZED OUTLET. IT IS USED ON THE TOP OF CUT SLOPES 2:1 AND STEEPER. EXCLUDING ROCK SLOPES THAT CANNOT BE EXCAVATED BY RIPPING. OR THE TOP OF FILL SLOPES WHERE THERE IS POTENTIAL FOR ROAD BED RUNOFF. THIS BMP CAN BE USED ON FLATTER SLOPES AT THE DISCRETION OF THE ENGINEER.

CONSTRUCT RUN-ON DIVERSION/CONTROL STRUCTURES IN CONJUNCTION WITH CLEARING AND GRUBBING AND PRIOR TO GRADING OPERATIONS. IF IT IS TO REMAIN IN PLACE FOR LONGER THAN 15 DAYS IT REQUIRES EROSION SEED, GRAVEL OR RIPRAP.

INSTALL SLOPE DRAINS WHERE NEEDED TO PREVENT CONCENTRATION OF WATER AND OVER-TOPPING OF BERM. PLACE VELOCITY DISSIPATERS AT THE TERMINUS OF DITCHES AND WHERE NEEDED. APPROPRIATE SUPPLEMENTS INCLUDE TEMPORARY SEEDING. EROSION SEEDING. SLOPE DRAINS OR DITCH SEDIMENT TRAPS.


DENSIFY TO THE SATISFACTION OF THE ENGINEER. EXCAVATION FROM CONTOUR DITCH MAY BE PLACED ON DOWNSLOPE SIDE AND SHAPED TO FORM A DIKE TO INCREASE THE DITCH CAPACITY. EROSION CONTROL SEED UPON CONSTRUCTION AND PRIOR TO COMPACTION.


EXCAVATION FROM CONTOUR DITCH MAY BE PLACED ON DOWNSLOPE SIDE AND SHAPED TO FORM A DIKE TO INCREASE THE DITCH CAPACITY. EROSION CONTROL SEED UPON CONSTRUCTION AND PRIOR TO COMPACTION.



RUN-ON DIVERSION/CONTROL

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 208
DWG. NO.
208-20

RUN-ON DIVERSION/CONTROL
(P-05)

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

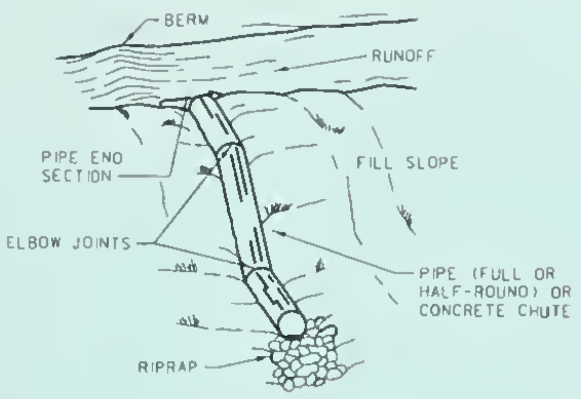
SYMBOL: —(SO)—

SLOPE DRAINS BMP P-06:

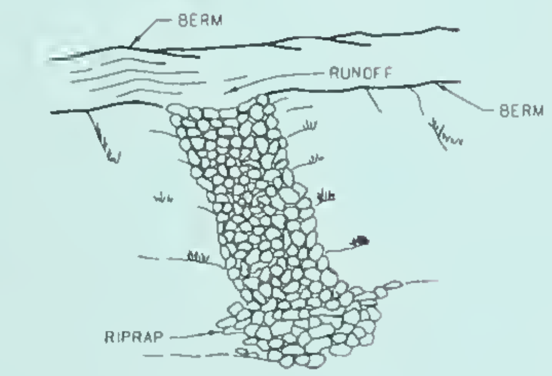
SLOPE DRAINS (SD) CONSIST OF A FLEXIBLE PIPE, RIGID PIPE, GEOTEXTILE-LINED CHANNEL OR RIPRAP-LINED CHANNEL. SLOPE DRAINS ARE USED WITH RUN-ON DIVERSION/CONTROL OR ALONG THE TOE OF FILL IN CUT TO FILL TRANSITIONS. SLOPE DRAINS EXTEND FROM THE COLLECTION POINT TO THE BOTTOM OF THE SLOPE AND DISCHARGE INTO A DRAINAGE CHANNEL OR A STABILIZED AREA (NOT STATE WATERS).

SLOPE DRAINS CONVEY CONCENTRATED RUNOFF DOWN UNPROTECTED CUT OR FILL SLOPES OR CUT/FILL TRANSITIONS WITHOUT CAUSING GULLIES, CHANNELS, OR SATURATION OF SLIDE-PRONE SOILS OF A CUT OR FILL SLOPE. DESIGN RIPRAP-LINED DITCHES ON A SITE-SPECIFIC BASIS. RIPRAP SIZE IS A FUNCTION OF EXPECTED WATER VELOCITY. APPROPRIATE SUPPLEMENTS INCLUDE VELOCITY REDUCTION AND SEDIMENT RETENTION BARRIERS.

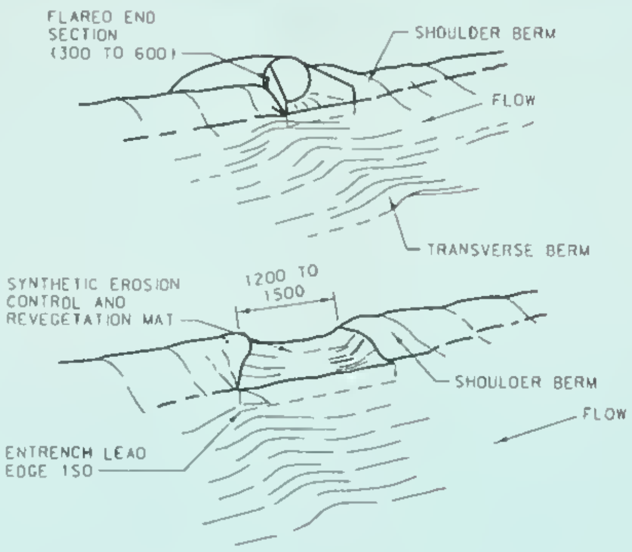
PIPE SLOPE DRAIN



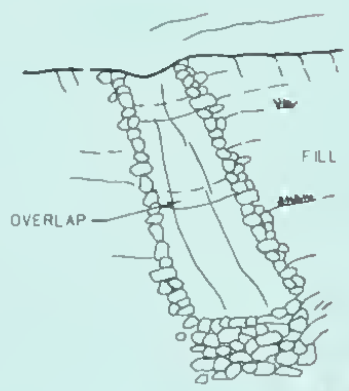
RIPRAP SLOPE DRAIN



SLOPE DRAIN INLETS



DITCH LINER: SYNTHETIC EROSION CONTROL AND REVEGETATION MAT



ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 208
DWG. NO.
208-25
SLOPE DRAINS
(P-06)
EFFECTIVE: AUGUST 1999
MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

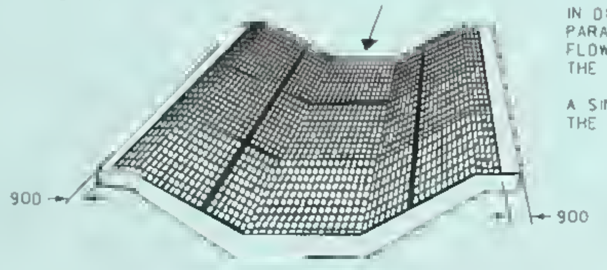
SYMBOL: —(EM)—

EROSION MAT BMP P-07:

EROSION MAT (EM) IS A VEGETATIVE MULCH MATERIAL, JUTE MAT OR SYNTHETIC GEOMEMBRANE THAT MUST BE ANCHORED. EROSION MATS ARE USED TO PROTECT EXPOSED SOILS, ENHANCE PLANT ESTABLISHMENT OR LINE DITCH BOTTOMS.

LAP EROSION MATS AND ANCHOR ACCORDING TO THE MANUFACTURER'S SPECIFICATIONS, CONFORMING WITH MDT STANDARD SPECIFICATION 610.03.4. BLANKET LENGTHS ARE LIMITED TO 8 METERS TO PREVENT BRIDGING OF THE BLANKET ABOVE SETTLING SOILS. EXTEND THE TOP EDGE OF THE BLANKET AT LEAST 900 mm BEYOND THE TOP OF THE SLOPE. EROSION MATS ARE REQUIRED WHEN THE MOST ERODABLE CONDITIONS EXIST IN THE SOIL, SLOPE, SURFACE WATER AND PRECIPITATION CATEGORIES.

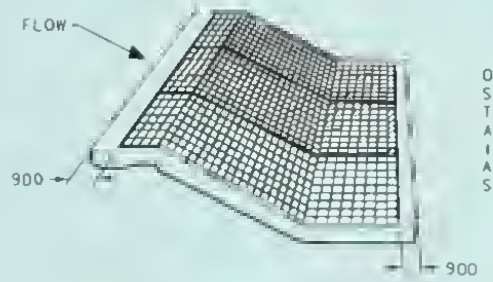
DITCH



IN DITCHES, APPLY NETTING PARALLEL TO THE DIRECTION OF FLOW. DO NOT JOIN STRIPS IN THE CENTER OF THE DITCH.

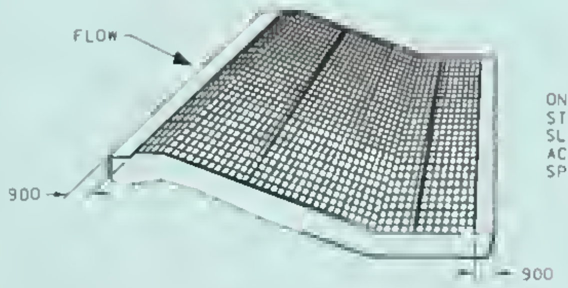
A SINGLE RUN MAY BE USED AT THE DISCRETION OF THE ENGINEER.

STEEP SLOPE



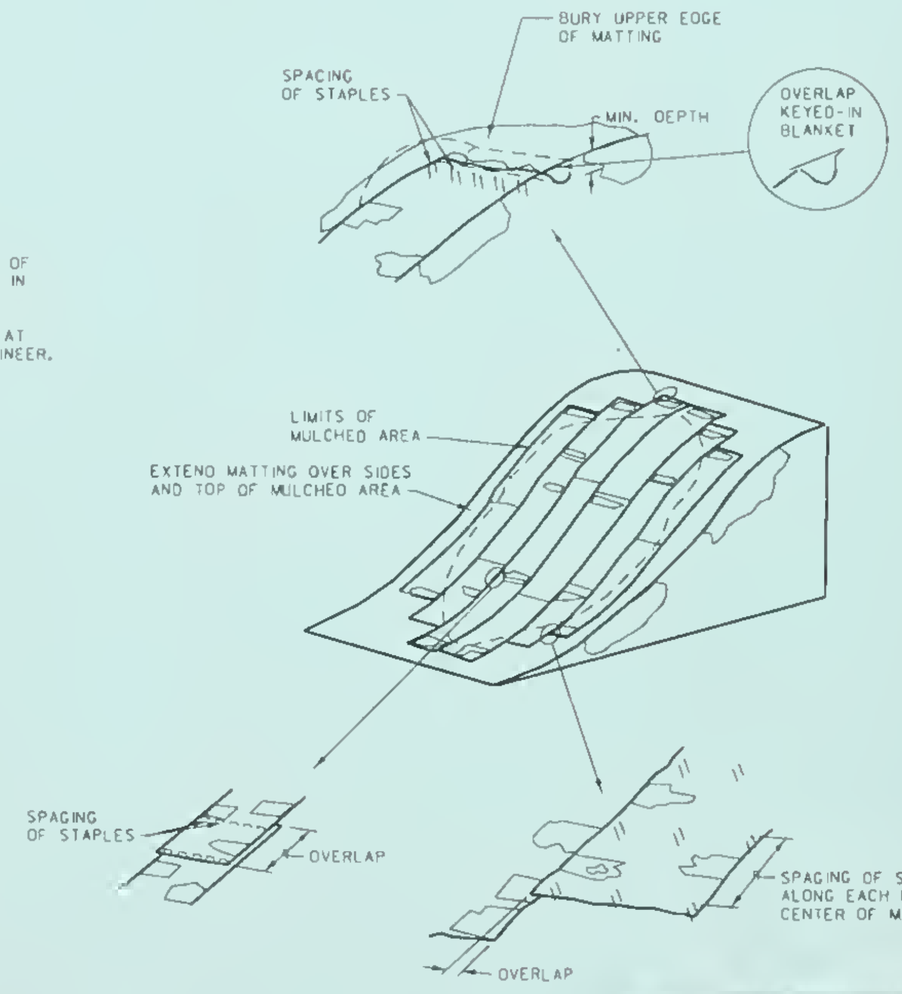
ON STEEP SLOPES, APPLY STRIPS OF NETTING PARALLEL TO THE DIRECTION OF FLOW AND ANCHOR SECURELY (STEEPER THAN 3:1 OR ACCORDING TO MANUFACTURER'S SPECIFICATIONS).

SHALLOW SLOPE



ON SHALLOW SLOPES, APPLY STRIPS OF NETTING ACROSS THE SLOPE (3:1 OR FLATTER OR ACCORDING TO MANUFACTURER'S SPECIFICATIONS).

INSTALL ACCORDING TO THE MANUFACTURER'S SPECIFICATIONS.


BURY UPPER EDGE OF MATTING
SPACING OF STAPLES
MIN. DEPTH
OVERLAP KEYED-IN BLANKET
LIMITS OF MULCHED AREA
EXTEND MATTING OVER SIDES AND TOP OF MULCHED AREA
SPACING OF STAPLES
OVERLAP
SPACING OF STAPLES ALONG EACH EDGE AND CENTER OF MATTING
OVERLAP

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 208
DWG. NO.
208-30
EROSION MAT
(P-07)
EFFECTIVE: AUGUST 1999
MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

SYMBOL: —(DT#)—

DITCH SEDIMENT TRAPS BMP R-01:

DITCH SEDIMENT TRAPS (DT#) IS TERMINOLOGY USED TO DESCRIBE THE SELECTION OF ONE OF FOUR TEMPORARY SEDIMENT BARRIERS USED AT INTERVALS ALONG A CONCENTRATED RUNOFF FLOW PATH. THE DESIGNER DETERMINES THE LOCATIONS REQUIRING DITCH SEDIMENT TRAPS AND THE PROPER INTERVALS AND THE ENGINEER DETERMINES WHICH TEMPORARY SEDIMENT BARRIER WILL BE USED. REFER TO DUGOUT DITCH BASIN, GRAVEL FILTER BERM, SEDIMENT CONTROL FENCE AND EROSION MAT DETAILED DRAWINGS FOR INSTALLATIONS.

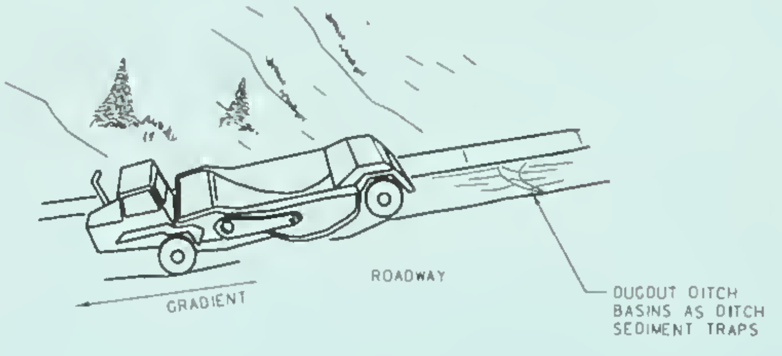
DITCH SEDIMENT TRAPS ARE USED FOR LONGITUDINAL ROADSIDE DITCHES IN A CUT SECTION OR AS LONGITUDINAL SEDIMENT RETENTION BASINS AT THE TOE OF FILLS. DITCH SEDIMENT TRAPS REDUCE RUNOFF VELOCITY AND PROMOTE SEDIMENT SETTLING. THE DISTANCE BETWEEN DITCH SEDIMENT TRAPS IS DEPENDENT ON THE LENGTH OF DITCH SECTION RELATING TO THE GRADE THAT NEEDS SEDIMENT RETENTION. THE INTERVAL IS AS FOLLOWS:

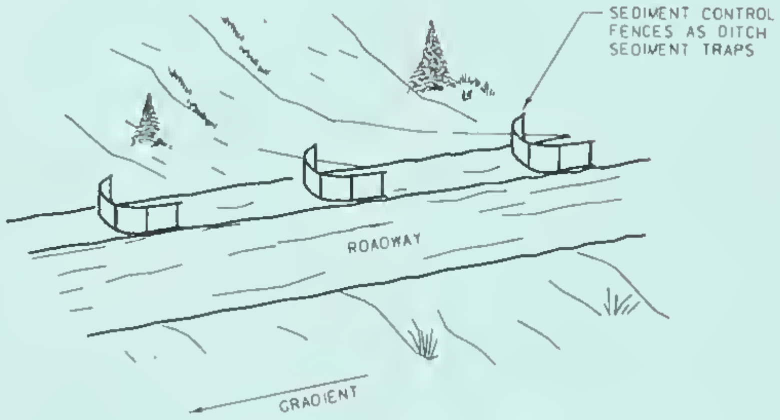
DT1 : 2% TO 3%
DUGOUT DITCH BASINS AT 90 METERS OR
GRAVEL FILTER BERMS AT 90 METERS OR
SEDIMENT CONTROL FENCES AT 150 METERS OR
EROSION MAT

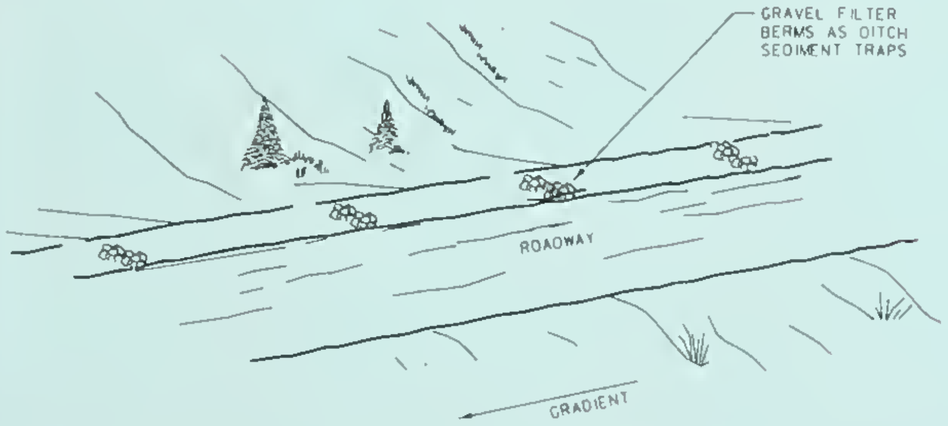
DT2 = 3% TO 4%
UGOUT DITCH BASINS AT 45 METERS OR
RAVEL FILTER BERMS AT 60 METERS OR
EDIMENT CONTROL FENCES AT 90 METERS OR
ROSION MAT

T3 = 4% +
UGOUT DITCH BASINS AT 15 METERS OR
RAVEL FILTER BERMS AT 30 METERS OR
EDIMENT CONTROL FENCES AT 45 METERS OR
ROSION MAT

HESE VALUES ARE EMPIRICAL: THEY ARE THE MAXIMUM INTERVAL DISTANCES FOR A 2 YEAR, 4 HOUR RAIN EVENT. INTERVALS MAY BE SHORTENED AT THE DISCRETION OF THE ENGINEER F SOIL CONDITIONS AND/OR PRECIPITATION INDICATE A NEED TO DO SO.







DETAILED DRAWING
REFERENCE DWG. NO.
STANDARD SPEC. 208-35
SECTION 208

DITCH SEDIMENT TRAPS
(R-01)

EFFECTIVE: AUGUST 1999

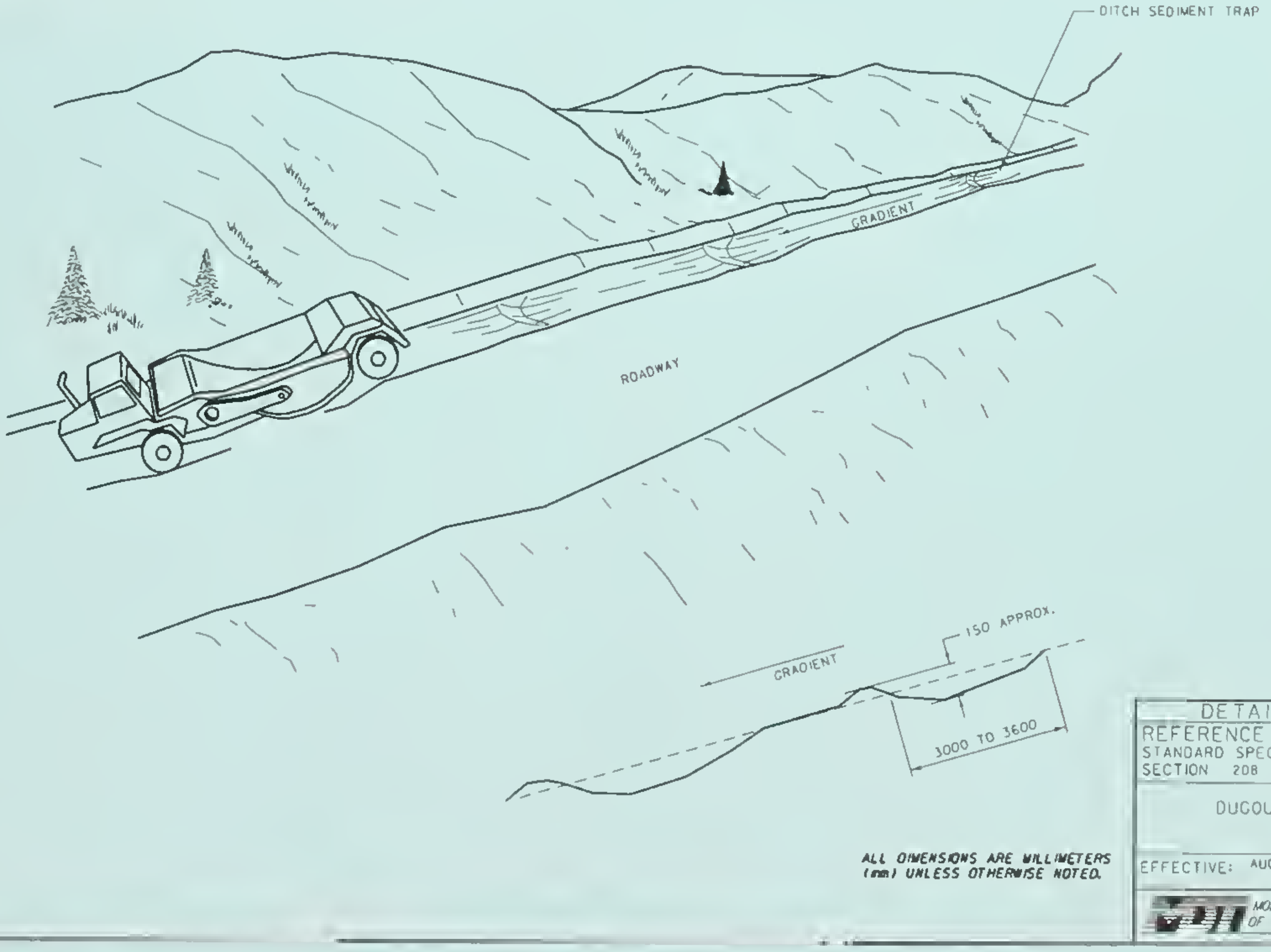
MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

SYMBOL: —(DDB)—

DUGOUT DITCH BASIN BMP R-02:

DUGOUT DITCH BASINS (DDB) CONSIST OF ONE OR A SERIES OF SMALL DUGOUT BASINS USED FOR CONCENTRATED FLOWS TO REDUCE RUNOFF VELOCITY, PROMOTE SEDIMENT RETENTION AND ALLOW SETTLING. THE MAXIMUM HEIGHT FOR DUGOUT DITCH BASINS USED INSIDE THE CLEAR ZONE IS 150 mm.

DUGOUT DITCH BASINS ARE USED FOR LONGITUDINAL SLOPE STEEPNESS (GRADE) SEDIMENT RETENTION. APPLICATIONS INCLUDE DITCH SEDIMENT TRAPS, INTERCEPTOR DITCHES AND TOE OF SLOPE PROTECTION. DISTANCES BETWEEN DUGOUT DITCH BASINS ARE SHOWN ON DTL. DWG. NO. 208-35 FOR USE IN DITCH SEDIMENT RETENTION. USE ON SLOPES IS DEPENDENT ON SOIL TYPES.



ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE DWG. NO.
STANDARD SPEC. 208-40
SECTION 208

DUGOUT DITCH BASIN
(R-02)

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

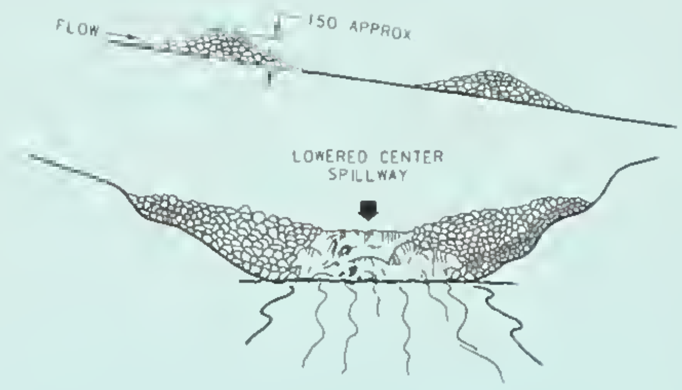
SYMBOL: —(GFB)—

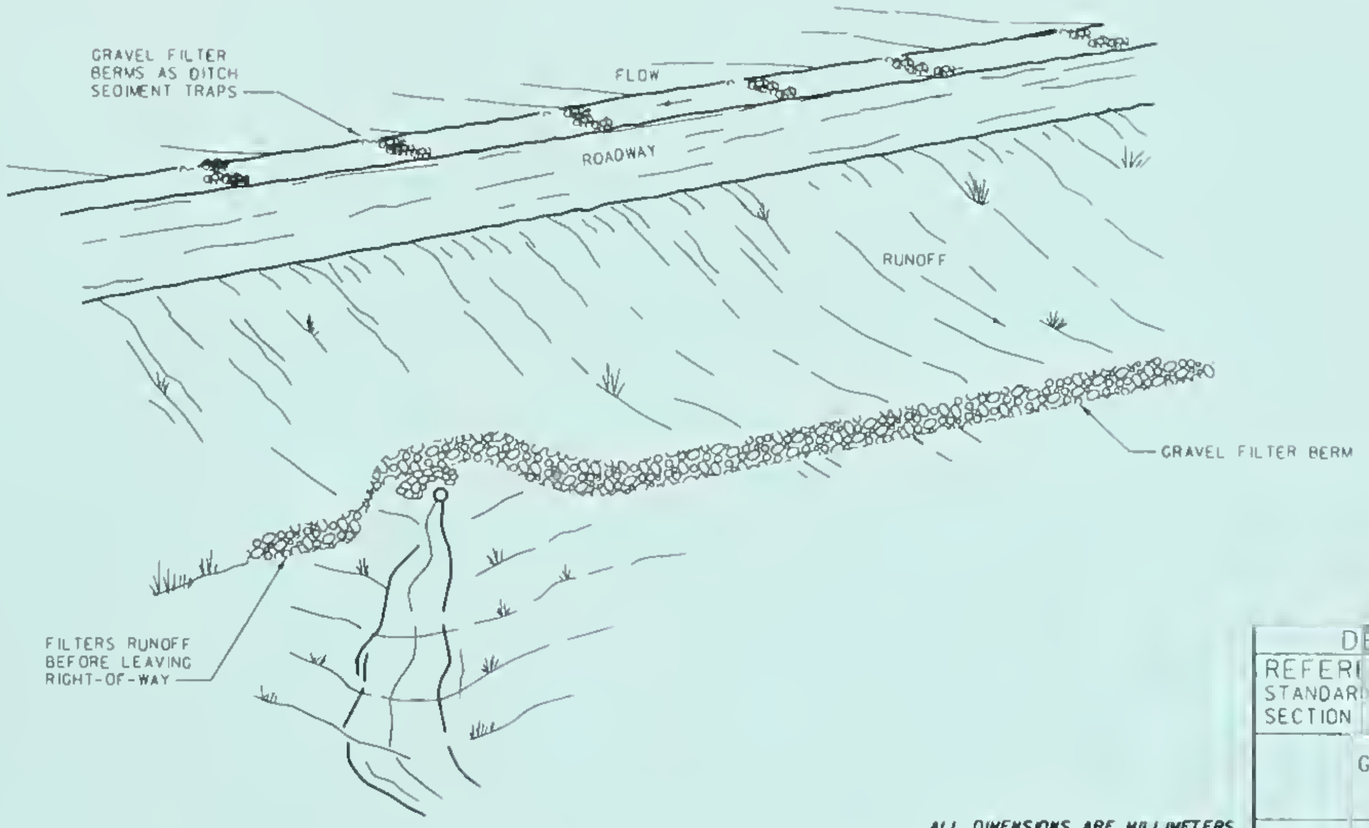
GRAVEL FILTER BERM BMP R-03:

GRAVEL FILTER BERMS (GFB) CONSIST OF A SINGLE OR SERIES OF GRAVEL BERMS TO REDUCE RUNOFF VELOCITIES AND RETAIN SEDIMENT. THE MAXIMUM HEIGHT FOR GRAVEL FILTER BERMS USED INSIDE THE CLEAR ZONE IS 150 mm.

BERM MATERIAL MUST BE 100% PASSING THE 50 mm SCREEN AND 10% MAXIMUM PASSING THE 4.75 mm SIEVE. BERM MATERIAL MAY BE PITRUN OR CRUSHED AGGREGATE.

GRAVEL FILTER BERMS ARE USED FOR SHEET OR CONCENTRATED FLOWS TO REDUCE RUNOFF VELOCITY, PROMOTE SEDIMENT RETENTION AND ALLOW SETTLING. APPLICATIONS INCLUDE DITCH SEDIMENT TRAPS, INLET/OUTLET PROTECTION AND TOE OF SLOPE PROTECTION. AS A DITCH SEDIMENT TRAP, THE END OF THE BARRIER MUST EXTEND A SUFFICIENT DISTANCE TO PREVENT END CUTTING. POSITION THE BARRIER TO PREVENT SEDIMENT FROM ENTERING DRAINAGE. DO NOT PLACE THE BARRIER ACROSS LIVE STREAMS. DISTANCES BETWEEN GRAVEL FILTER BERMS ARE SHOWN ON DTL. DWG. NO. 20‑‑35 FOR USE IN DITCH SEDIMENT RETENTION. REMOVE SEDIMENT FROM BEHIND THE BERM WHEN IT ACCUMULATES TO ONE-HALF THE ORIGINAL HEIGHT UNLESS ITS DRAINAGE AREA HAS BEEN STABILIZED.




GRAVEL FILTER BERMS AS DITCH SEDIMENT TRAPS
FLOW
ROADWAY
RUNOFF
GRAVEL FILTER BERM
FILTERS RUNOFF BEFORE LEAVING RIGHT-OF-WAY

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 208
DWG. NO.
208-45
GRAVEL FILTER BERM
(R-03)
EFFECTIVE: AUGUST 1999
MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

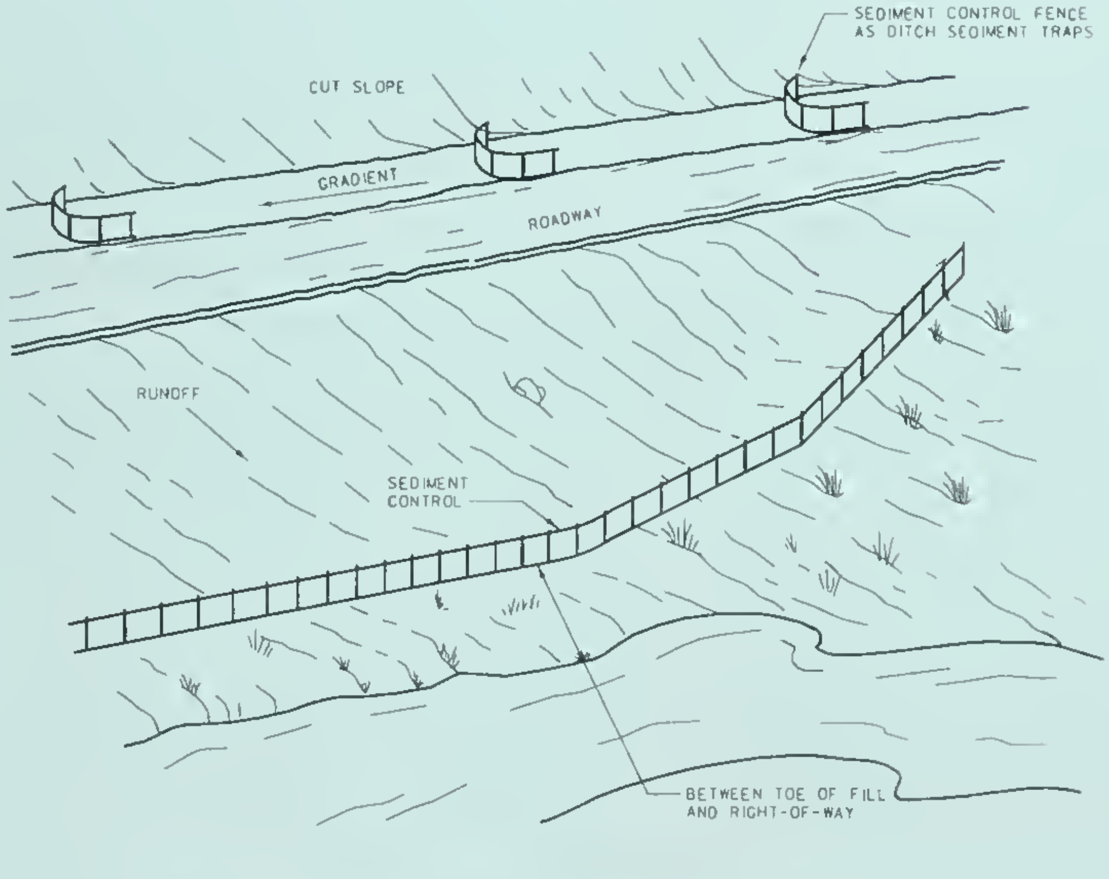
SYMBOL: —(SCF)—

SEDIMENT CONTROL FENCE BMP R-04:

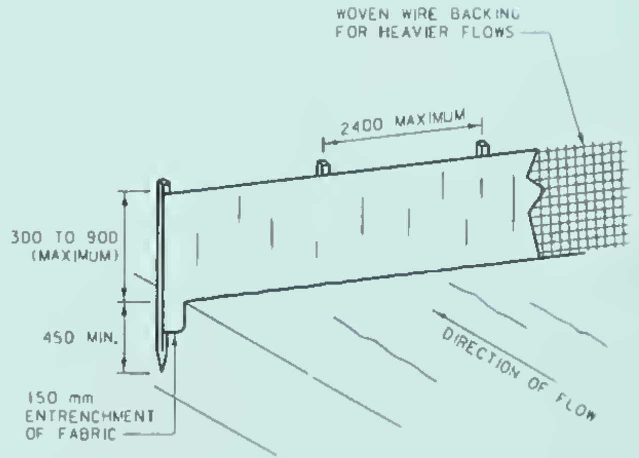
SEDIMENT CONTROL FENCE (SCF) IS A SINGLE OR SERIES OF FILTER FABRIC SEDIMENT BARRIER STRETCHED AND ATTACHED TO SUPPORTING POSTS. THE FENCE BOTTOM IS ENTRENCHED.

SEDIMENT CONTROL FENCES ARE USED FOR SHEET OR CONCENTRATED FLOWS TO ASSIST IN SEDIMENT CONTROL BY RETAINING SOME OF THE ERODED SOIL PARTICLES AND SLOWING THE RUNOFF VELOCITY TO ALLOW PARTICLE SETTLING. APPLICATIONS INCLUDE DITCH SEDIMENT TRAPS, WATER RESOURCE PROTECTION, INLET/OUTLET PROTECTION, BANK PROTECTION, TOE OF SLOPE PROTECTION AND CHANNEL CHANGES. INSTALL SEDIMENT CONTROL FENCES PRIOR TO DISTURBING AREAS REQUIRING THIS BMP OR AS SLOPE GRADES ARE ACHIEVED. MAXIMUM CUT OR FILL SLOPE FOR A SEDIMENT CONTROL FENCE IS 2:1. USE 50 mm BY 50 mm (NOMINAL) WOODEN STAKES. DO NOT USE METAL STAKES.

SEDIMENT CONTROL FENCES ARE USED BETWEEN THE EDGE OF CONSTRUCTION DISTURBANCE AND A WATER RESOURCE, CRITICAL RESOURCE OR RIGHT-OF-WAY LINE THAT IS ADJACENT TO CONSTRUCTION ACTIVITY. IN DITCHES AND SWALES THE ENDS OF THE FENCE CURVE UPSTREAM TO PREVENT FLOW FROM BY-PASSING THE FENCE. POSITION THE BARRIER TO PREVENT SEDIMENT FROM ENTERING THE DRAINAGE. DO NOT PLACE THE BARRIER ACROSS LIVE STREAMS. WOVEN WIRE BACKING IS NECESSARY WHEN DEALING WITH HEAVIER FLOW VELOCITIES AND SEDIMENT OR AS A ROCK BARRIER. DISTANCES BETWEEN SEDIMENT CONTROL FENCES ARE SHOWN ON DTL. DWG. NO. 208-35 FOR USE IN DITCH SEDIMENT RETENTION. REMOVE SEDIMENT FROM BEHIND THE FENCE WHEN IT ACCUMULATES TO ONE-THIRD THE ORIGINAL HEIGHT. EITHER GRADE AND SEED OR REMOVE THE SEDIMENT DEPOSITS PRIOR TO REMOVAL OF THE FENCE.


SEDIMENT CONTROL FENCE AS DITCH SEDIMENT TRAPS
CUT SLOPE
GRADIENT
ROADWAY
RUNOFF
SEDIMENT CONTROL
BETWEEN TOE OF FILL AND RIGHT-OF-WAY

DITCH SEDIMENT TRAPS & PROTECTION OF LIVE STREAM


WOVEN WIRE BACKING FOR HEAVIER FLOWS
2400 MAXIMUM
300 TO 900 (MAXIMUM)
450 MIN.
150 mm ENTRENCHMENT OF FABRIC
DIRECTION OF FLOW

SILT FENCE CONSTRUCTION

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 208
DWG. NO.
208-50
SEDIMENT CONTROL FENCE
(R-04)
EFFECTIVE: AUGUST 1999
MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

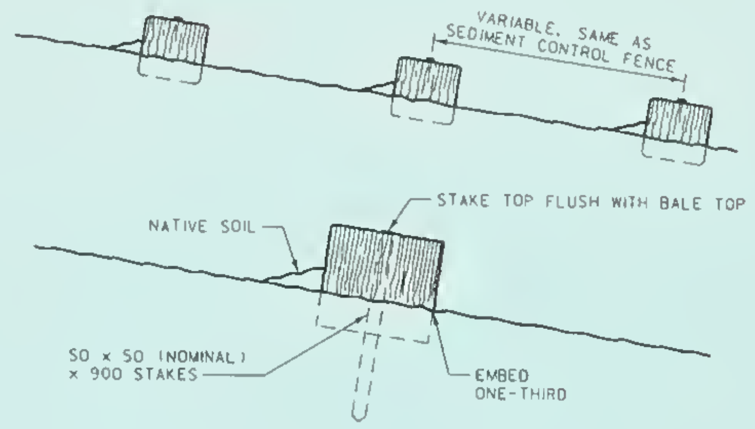
SYMBOL: ←—(SBB)—→

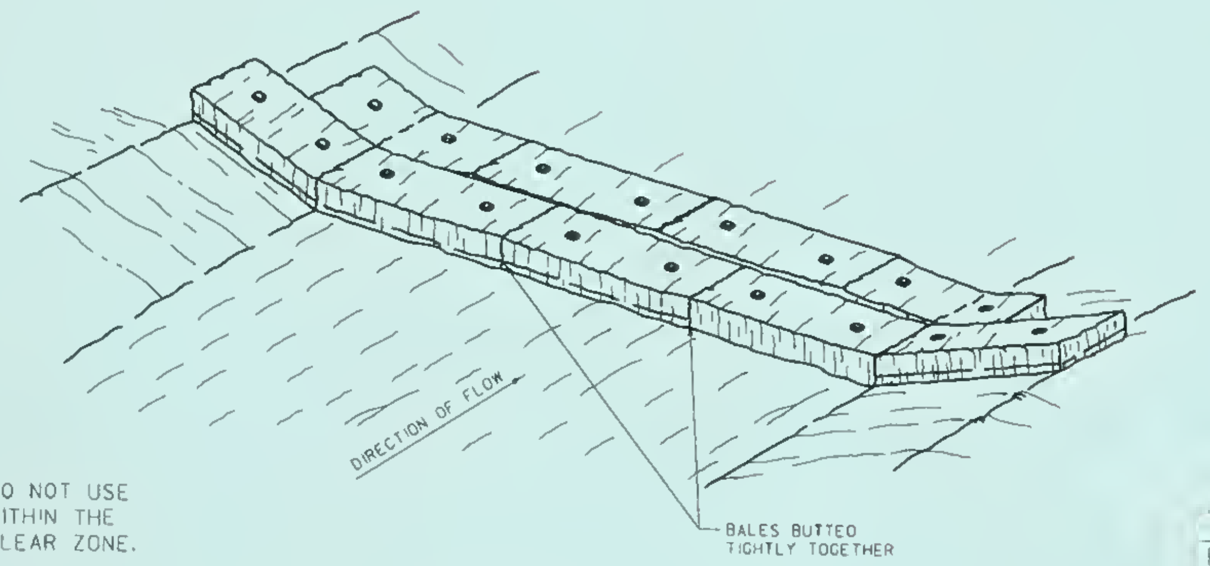
STRAW BALE BARRIER BMP R-05:

STRAW BALE BARRIER (SBB) IS A SEDIMENT BARRIER CONSISTING OF ENTRENCHED, OVERLAPPING AND ANCHORED STRAW BALES TO REDUCE RUNOFF VELOCITIES AND RETAIN SEDIMENT. DO NOT USE STRAW BALE BARRIERS INSIDE THE CLEAR ZONE. STRAW BALES MUST BE CERTIFIED WEED-FREE.

STRAW BALE BARRIERS ARE USED FOR SHEET OR CONCENTRATED FLOWS TO REDUCE RUNOFF VELOCITY, PROMOTE SEDIMENT RETENTION AND ALLOW SETTLING. ENTRENCH THE BARRIER APPROXIMATELY ONE-THIRD OF THE BALE'S HEIGHT AND BACKFILL ON THE UPHILL SIDE. USE 50 mm BY 50 mm (NOMINAL) BY 900 mm LONG WOODEN STAKES. DO NOT USE METAL STAKES. USE A MINIMUM OF TWO STAKES PER BALE.

AS A DITCH SEDIMENT TRAP, EXTEND THE END OF THE BARRIER TO SUCH AN EXTENT THAT THE BOTTOMS OF THE END BALES ARE HIGHER THAN THE TOPS OF THE LOWEST CENTER BALES. POSITION THE BARRIER TO PREVENT SEDIMENT FROM ENTERING THE DRAINAGE. DO NOT PLACE THE BARRIER ACROSS LIVE STREAMS. REPAIR OR REPLACE DAMAGED, UNDER-CUT OR END RUN BALES. APPLICATIONS INCLUDE (OUTSIDE THE CLEAR ZONE) DITCH SEDIMENT TRAPS, INLET/OUTLET PROTECTION, BANK PROTECTION AND TOE OF SLOPE PROTECTION.





DO NOT USE
WITHIN THE
CLEAR ZONE.

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE DWG. NO.
STANDARD SPEC. 208-55
SECTION 208

STRAW BALE BARRIER
(R-05)

EFFECTIVE: AUGUST 1999

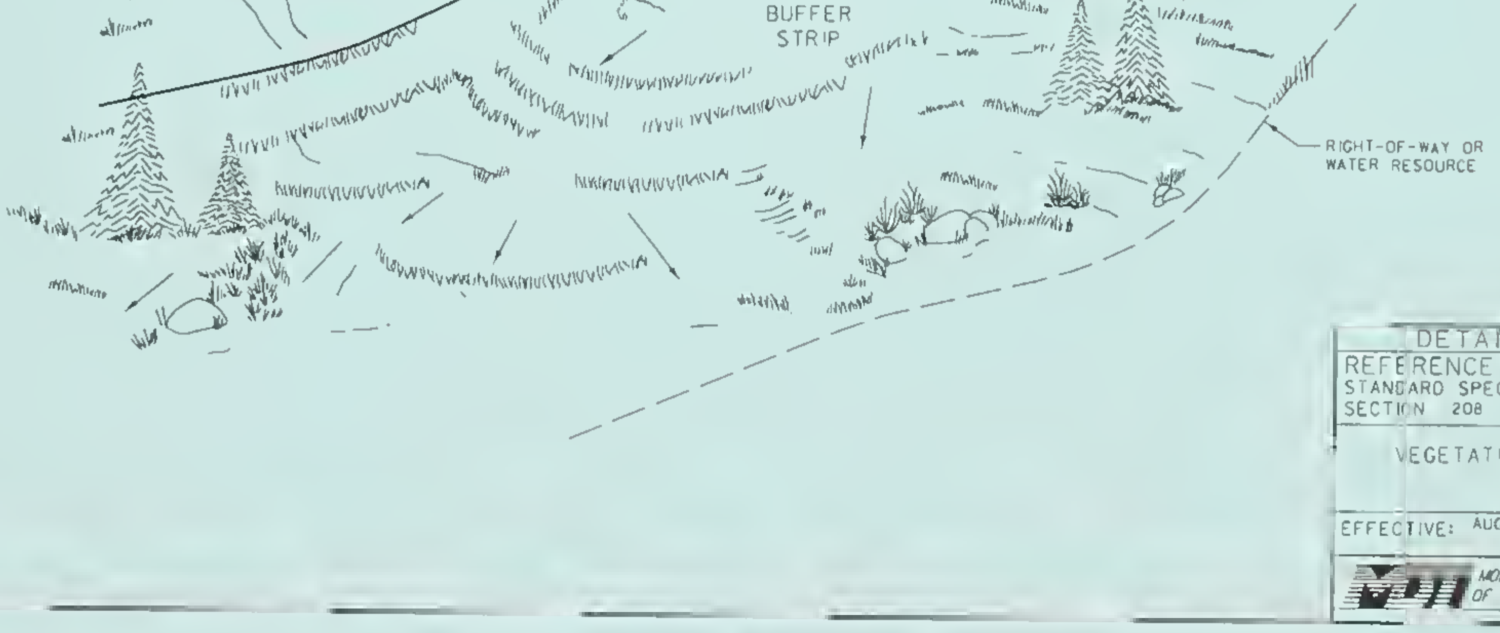
MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

SYMBOL: ←—(VBS)—→

VEGETATIVE BUFFER STRIP BMP R-06:

VEGETATIVE BUFFER STRIP (VBS) IS AN UNDISTURBED AREA OR STRIP OF ESTABLISHED NATURAL VEGETATION. A VEGETATIVE BUFFER STRIP PROVIDES A LIVING SEDIMENT FILTER TO REDUCE RUNOFF VELOCITIES AND ALLOW CAPTURE AND SETTLING OF COARSE-GRAINED SEDIMENT. VEGETATIVE BUFFER STRIPS REDUCE OR PREVENT SEDIMENTATION FROM LEAVING THE RIGHT-OF-WAY.

IDENTIFY VEGETATIVE BUFFER STRIPS WITH FLAGGING BEFORE CONSTRUCTION OCCURS. KEEP EQUIPMENT AND FILL MATERIAL OFF OF VEGETATIVE BUFFER STRIPS. ALWAYS CONSIDER VEGETATIVE BUFFER STRIPS WHEN WATER RESOURCES ARE ADJACENT TO OR NEAR DISTURBANCES AND REQUIRE PROTECTION. THE MINIMUM WIDTH REQUIREMENT FOR A WELL-ESTABLISHED VEGETATIVE STRIP WITH A SLOPE OF 3:1 OR FLATTER IS 15 m. THE MINIMUM WIDTH REQUIREMENT FOR A WELL-ESTABLISHED VEGETATIVE STRIP WITH A SLOPE STEEPER THAN 3:1 IS 30 m. APPROPRIATE SUPPLEMENTS INCLUDE GRAVEL BERMS, SEDIMENT CONTROL FENCES AND OTHER SEDIMENT RETENTION BARRIERS.



DETAILED DRAWING
REFERENCE DWG. NO.
STANDARD SPEC. 208-60
SECTION 208

VEGETATIVE BUFFER STRIP
(R-06)

EFFECTIVE: AUGUST 1999

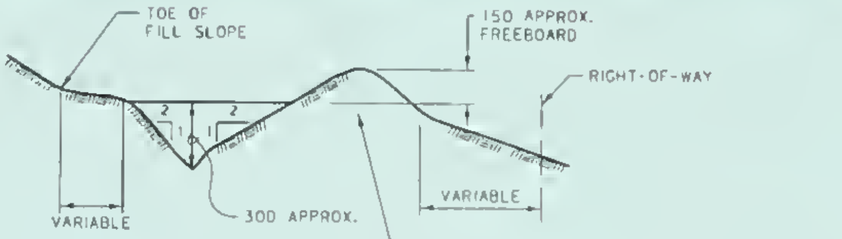
MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

SYMBOL: (RID)

RUNOFF INTERCEPTION DITCH BMP R-07:

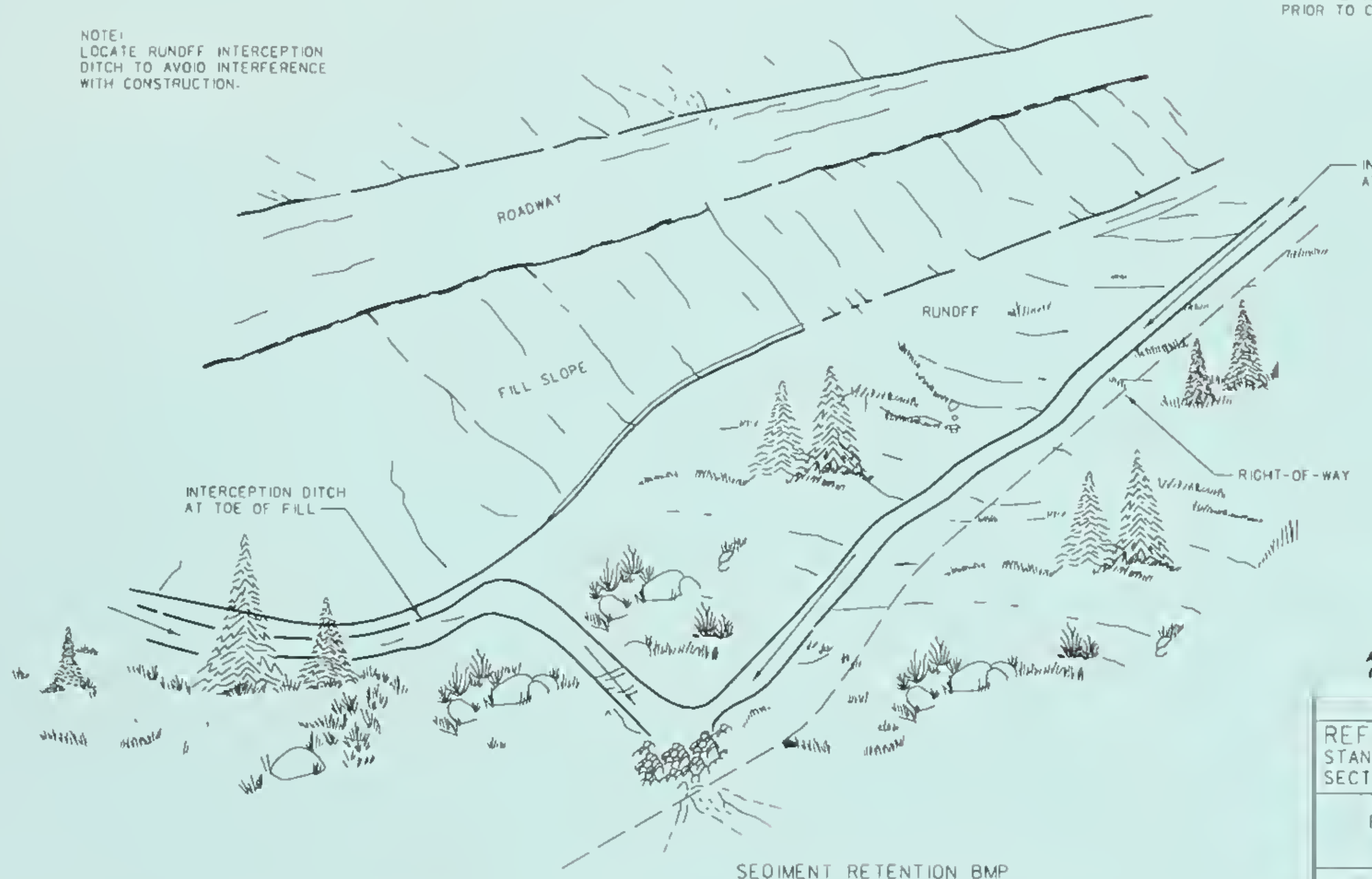
RUNOFF INTERCEPTION DITCHES (RID) INTERCEPT AND CONVEY SHEET FLOW RUNOFF TO SEDIMENT RETENTION BARRIERS. INTERCEPTED FLOWS PREVENT OFF-SITE DISCHARGE OF STORM WATER AND SEDIMENTATION.

USE RUNOFF INTERCEPTION DITCHES AT THE TOE OF SLOPES OR BETWEEN DISTURBED AREAS AND RIGHT-OF-WAY LINES TO PREVENT FLOWS FROM CARRYING SEDIMENT OFF-SITE. APPROPRIATE SUPPLEMENTS INCLUDE SLOPE DRAINS OR DITCH SEDIMENT TRAPS.



DENSIFY TO THE SATISFACTION OF THE ENGINEER. EXCAVATION FROM CONTOUR DITCH MAY BE PLACED ON DOWNSLOPE SIDE AND SHAPED TO FORM A DIKE TO INCREASE THE DITCH CAPACITY. EROSION CONTROL SEED UPON CONSTRUCTION AND PRIOR TO COMPACTION.

NOTE:
LOCATE RUNOFF INTERCEPTION DITCH TO AVOID INTERFERENCE WITH CONSTRUCTION.


ROADWAY
FILL SLOPE
RUNOFF
INTERCEPTION DITCH AT RIGHT-OF-WAY
RIGHT-OF-WAY
INTERCEPTION DITCH AT TOE OF FILL

SEDIMENT RETENTION BMP

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

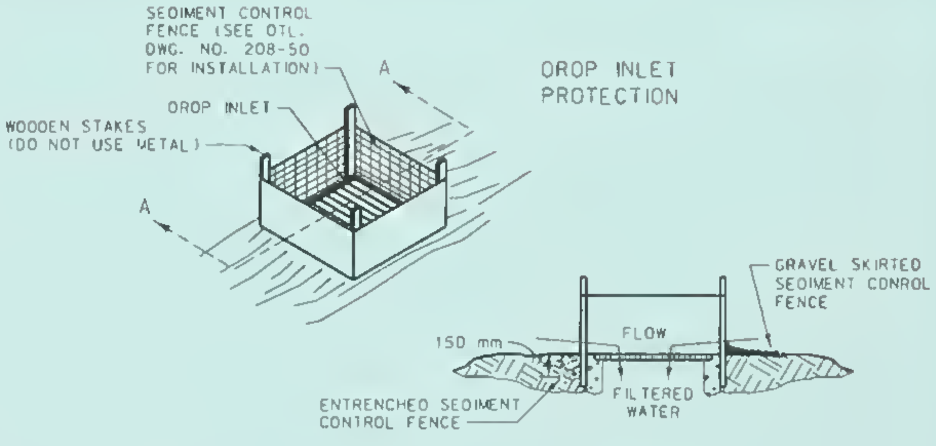
DETAILED DRAWING
REFERENCE DWG. NO.
STANDARD SPEC. SECTION 208
208-65
RUNOFF INTERCEPTION DITCH
(R-07)
EFFECTIVE: AUGUST 1999
MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

SYMBOL: (I/O)

INLET/OUTLET PROTECTION BMP R-08:

INLET/OUTLET PROTECTION (I/O) ARE STRUCTURES ASSOCIATED WITH SEDIMENT REMOVAL AT INLETS AND SEDIMENT REMOVAL AT PIPE OUTLETS. THE PURPOSE OF THIS BMP IS TO ALLOW STORM WATERS OF INTERMITTENT DRAINAGES TO FLOW THROUGH DISTURBED AREAS WITH MINIMAL IMPACT DURING STORM EVENTS AND TO KEEP SEDIMENT FROM LEAVING MDT PROPERTY.

INLET/OUTLET PROTECTION IS USED AT CULVERT INSTALLATIONS THAT DISCHARGE DIRECTLY INTO A WATER RESOURCE OR CULTURAL AND HISTORICAL RESOURCE ADJACENT TO THE RIGHT-OF-WAY LINE. DO NOT USE INLET/OUTLET PROTECTION ON STOCK UNDERPASSES OR APPROACH CULVERTS.


SEDIMENT CONTROL FENCE (SEE DTL. DWG. NO. 208-50 FOR INSTALLATION)
DROP INLET
WOODEN STAKES (DO NOT USE METAL)
A
A
150 mm
FLOW
FILTERED WATER
ENTRENCHED SEDIMENT CONTROL FENCE
GRAVEL SKIRTED SEDIMENT CONROL FENCE

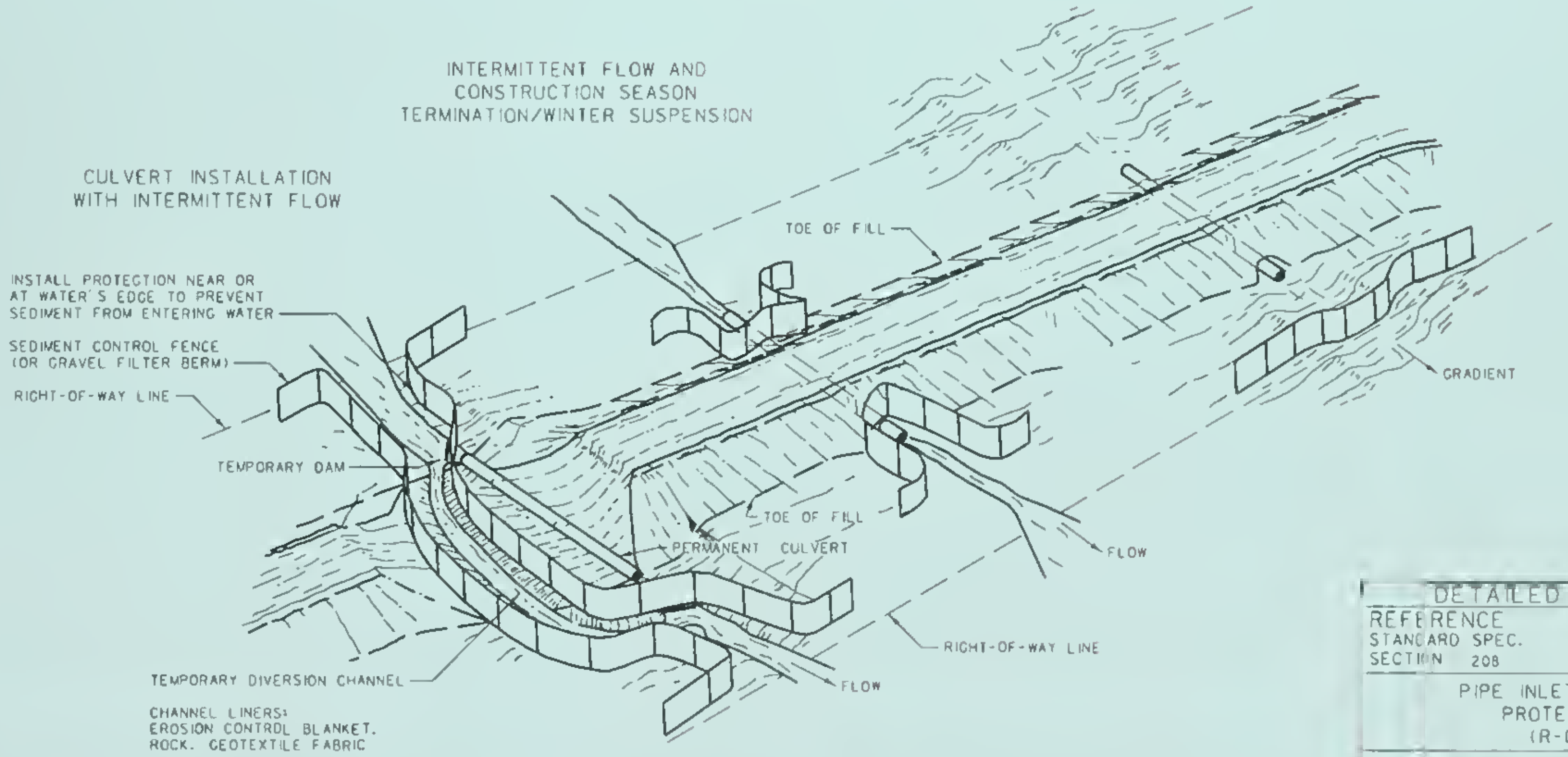
DROP INLET PROTECTION

SECTION A-A

CULVERT IN A SWALE

INTERMITTENT FLOW AND CONSTRUCTION SEASON TERMINATION/WINTER SUSPENSION

CULVERT INSTALLATION WITH INTERMITTENT FLOW



INSTALL PROTECTION NEAR OR AT WATER'S EDGE TO PREVENT SEDIMENT FROM ENTERING WATER

CHANNEL LINERS:
EROSION CONTROL BLANKET.
ROCK. GEOTEXTILE FABRIC

DETAILED DRAWING
REFERENCE DWG. NO.
STANDARD SPEC. SECTION 208
208-70
PIPE INLET/OUTLET PROTECTION
(R-08)
EFFECTIVE: AUGUST 1999
MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

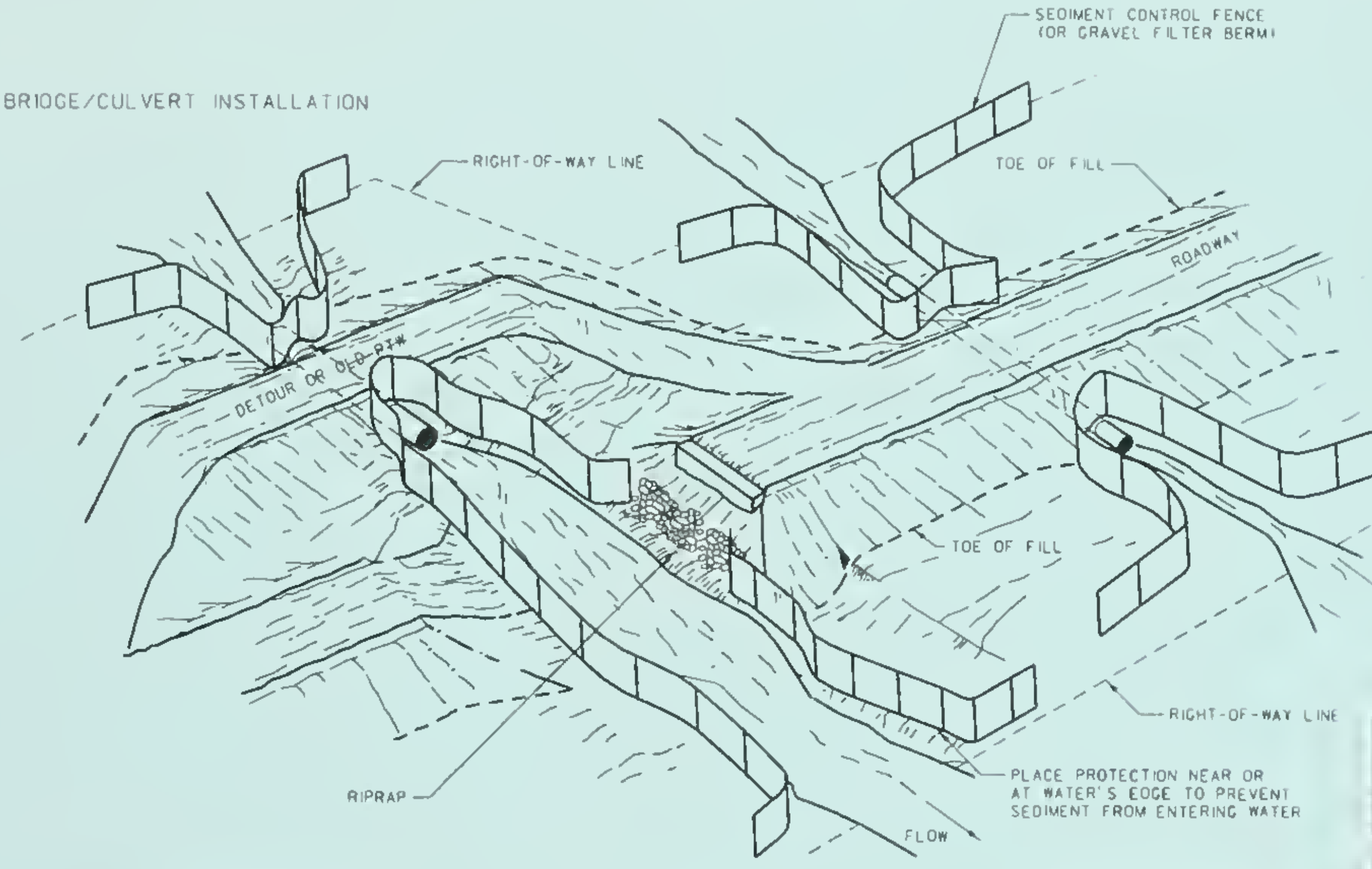
SYMBOL: (WP)

WATERWAY PROTECTION BMP W-01:

WATERWAY PROTECTION (WP) IS AN EROSION CONTROL FOR CONSTRUCTION ACTIVITIES CROSSING WATER RESOURCES. WATERWAY PROTECTION APPLIES TO PERENNIAL STREAM CROSSINGS, WETLANDS, CHANNEL CHANGES, STREAM BANK DISTURBANCES, IRRIGATION SYSTEMS OR OTHER IMPACTS TO WATER RESOURCES FROM BRIDGE CONSTRUCTION OR CULVERT INSTALLATIONS.

APPROPRIATE BMP FEATURES INCLUDE EROSION MAT, GRAVEL FILTER BERM, SEDIMENT CONTROL FENCE, STRAW BALE BARRIER OR VEGETATIVE BUFFER STRIP. ADDITIONAL BMP FEATURES INCLUDE SLOPE ROUGHENING, RUN-ON DIVERSION/CONTROL, DITCH SEDIMENT TRAP, DUGOUT DITCH BASINS AND RUNOFF INTERCEPTION DITCH. THIS BMP LIST IS NOT COMPREHENSIVE AND DOES NOT SUPERSEDE MDT STANDARD SPECIFICATIONS OR MANDATES AND REQUIREMENTS SPECIFIED BY OTHER AUTHORIZED STATE AND FEDERAL AGENCIES.

PERENNIAL STREAM CROSSING


BRIDGE/CULVERT INSTALLATION
SEDIMENT CONTROL FENCE (OR GRAVEL FILTER BERM)
RIGHT-OF-WAY LINE
TOE OF FILL
ROADWAY
DETOUR OR OLD R/W
TOE OF FILL
FLOW
RIGHT-OF-WAY LINE
PLACE PROTECTION NEAR OR AT WATER'S EDGE TO PREVENT SEDIMENT FROM ENTERING WATER
RIPRAP
FLOW

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 208
DWG. NO.
208-75

WATERWAY PROTECTION
(W-01)

EFFECTIVE: AUGUST 1999

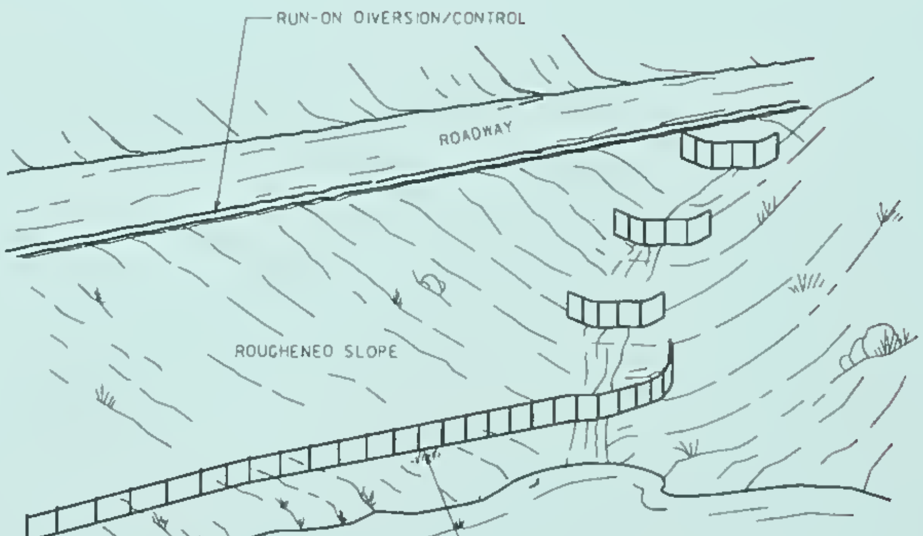
MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

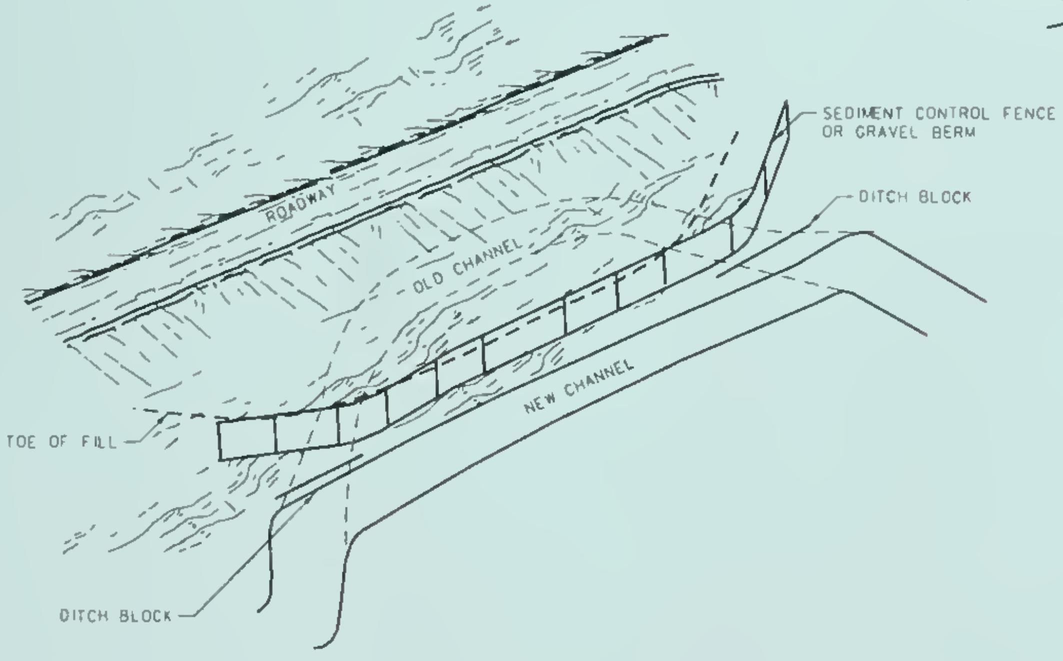
SYMBOL: —(WR)—

WATER RESOURCE PROTECTION BMP W-02:

WATER RESOURCE PROTECTION (WR) IS EROSION CONTROL FOR CONSTRUCTION ACTIVITIES ADJACENT TO WATER RESOURCES. WATER RESOURCE PROTECTION APPLIES TO PERENNIAL STREAMS, WETLANDS, CHANNEL CHANGES, STREAM BANK DISTURBANCES, IRRIGATION SYSTEMS OR OTHER IMPACTS TO WATER RESOURCES FROM ROAD CONSTRUCTION. IT CAN BE USED FOR CRITICAL RESOURCES. THE DESIGNER DENOTES "CRITICAL RESOURCE" ON THE PLANS AND PUTS WATER RESOURCE PROTECTION WITH IT.

APPROPRIATE BMP FEATURES INCLUDE EROSION MAT, GRAVEL FILTER BERM, SEDIMENT CONTROL FENCE, STRAW BALE BARRIER OR VEGETATIVE BUFFER STRIP. ADDITIONAL BMP FEATURES INCLUDE SLOPE ROUGHENING, RUN-ON DIVERSION/CONTROL, DITCH SEDIMENT TRAP, DUGOUT DITCH BASINS AND RUNOFF INTERCEPTION DITCH. THIS BMP LIST IS NOT COMPREHENSIVE AND DOES NOT SUPERSEDE MDT STANDARD SPECIFICATIONS OR MANDATES AND REQUIREMENTS SPECIFIED BY OTHER AUTHORIZED STATE AND FEDERAL AGENCIES.



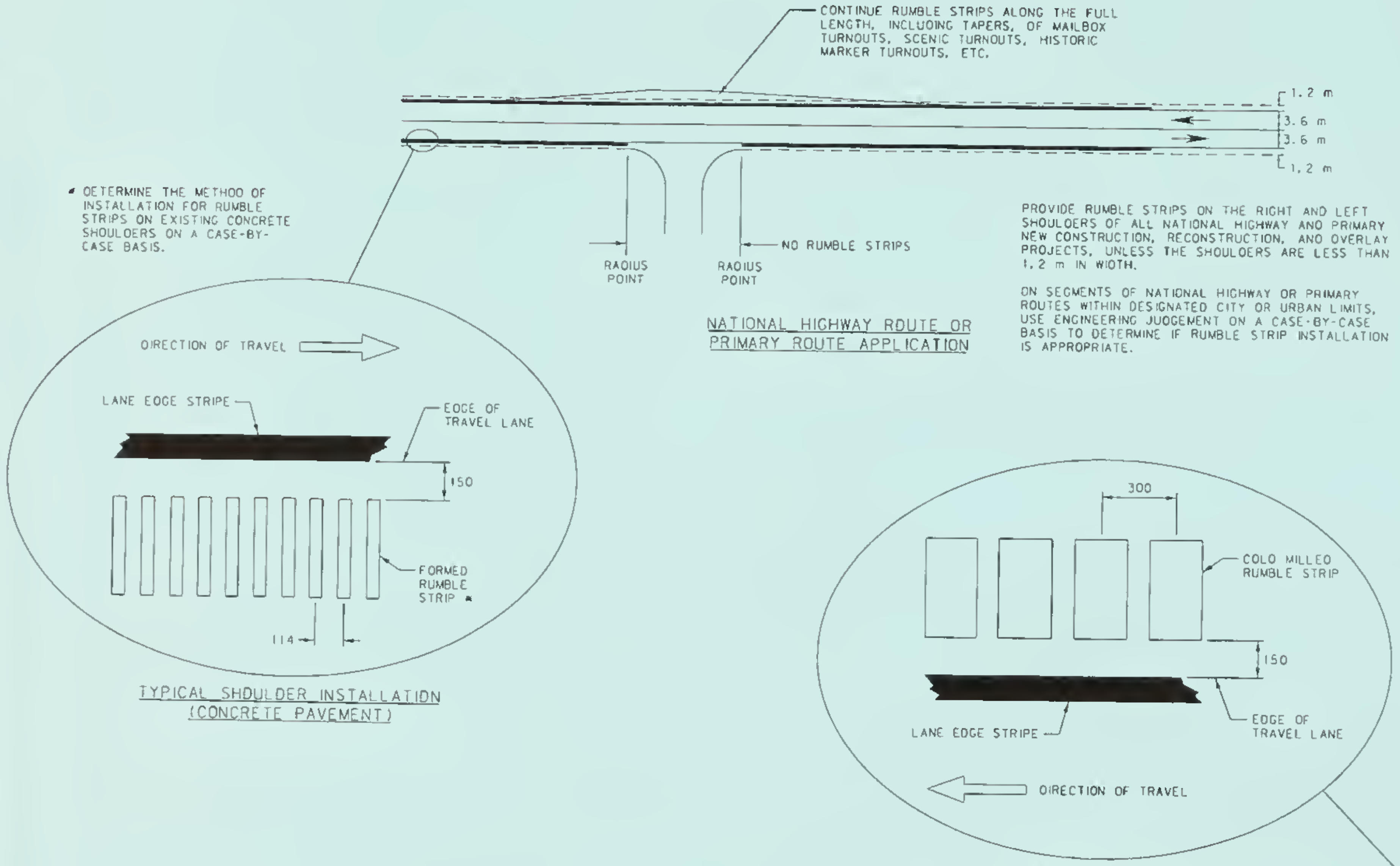


DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 208
DWG. NO.
208-80

WATER RESOURCE
PROTECTION
(W-02)

EFFECTIVE: AUGUST 1999

MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



* DETERMINE THE METHOD OF INSTALLATION FOR RUMBLE STRIPS ON EXISTING CONCRETE SHOULDERS ON A CASE-BY-CASE BASIS.

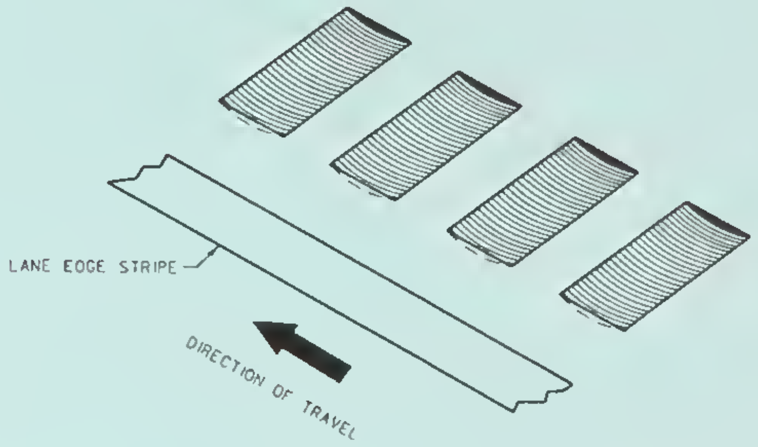
NATIONAL HIGHWAY ROUTE OR PRIMARY ROUTE APPLICATION

PROVIDE RUMBLE STRIPS ON THE RIGHT AND LEFT SHOULDERS OF ALL NATIONAL HIGHWAY AND PRIMARY NEW CONSTRUCTION, RECONSTRUCTION, AND OVERLAY PROJECTS, UNLESS THE SHOULDERS ARE LESS THAN 1.2 m IN WIDTH.

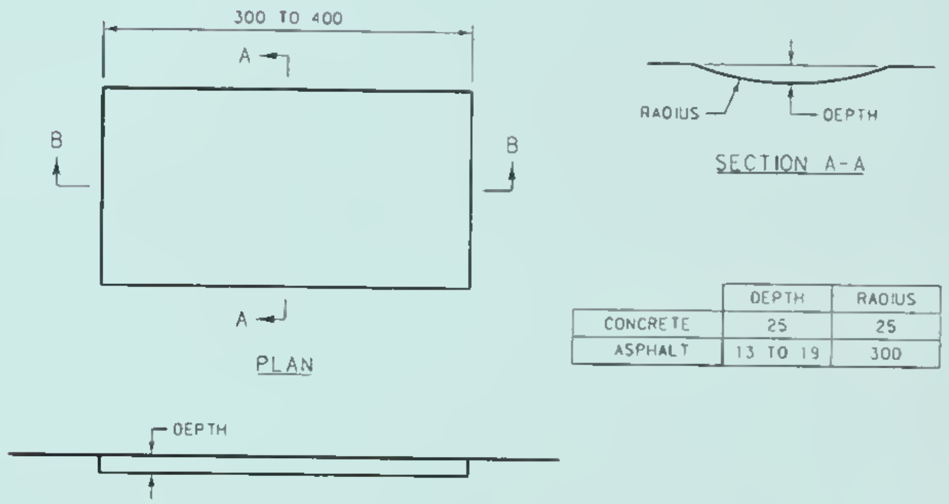
ON SEGMENTS OF NATIONAL HIGHWAY OR PRIMARY ROUTES WITHIN DESIGNATED CITY OR URBAN LIMITS, USE ENGINEERING JUDGEMENT ON A CASE-BY-CASE BASIS TO DETERMINE IF RUMBLE STRIP INSTALLATION IS APPROPRIATE.

TYPICAL SHOULDER INSTALLATION (CONCRETE PAVEMENT)

TYPICAL SHOULDER INSTALLATION (ASPHALT PAVEMENT)



ISOMETRIC VIEW



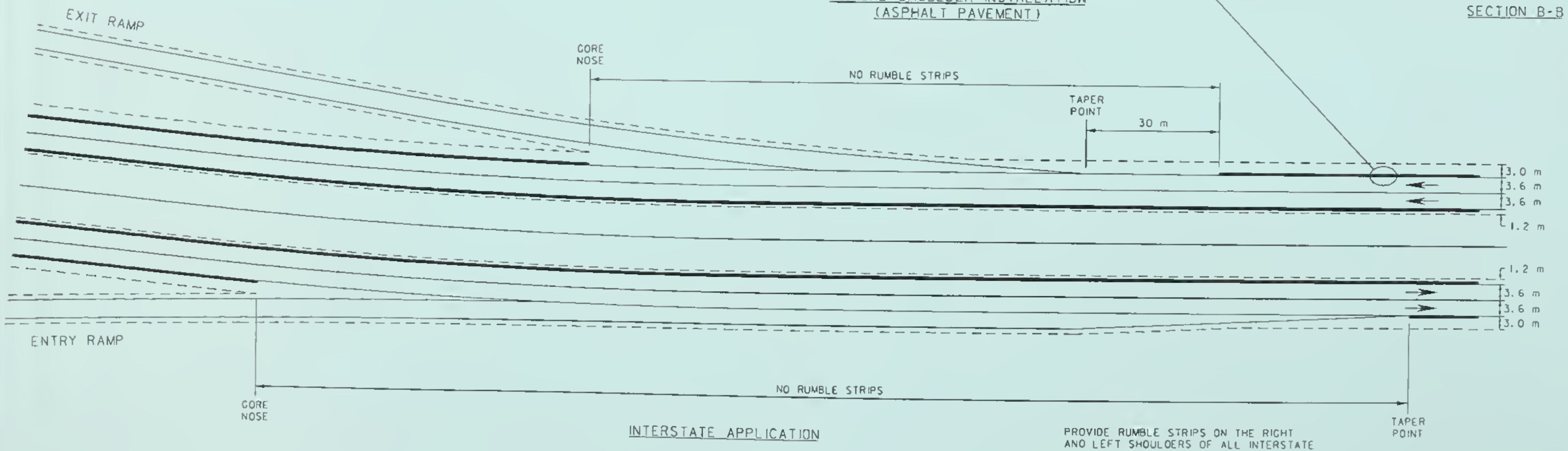
PLAN

SECTION A-A

SECTION B-B

	DEPTH	RADIUS
CONCRETE	25	25
ASPHALT	13 TO 19	300

RUMBLE STRIP DETAIL



INTERSTATE APPLICATION

PROVIDE RUMBLE STRIPS ON THE RIGHT AND LEFT SHOULDERS OF ALL INTERSTATE NEW CONSTRUCTION, RECONSTRUCTION, AND OVERLAY PROJECTS.

NOTES:

CONSTRUCT RUMBLE STRIPS IN ACCORDANCE WITH THE SPECIAL PROVISIONS OF THE PROJECT.

DO NOT INSTALL RUMBLE STRIPS OVER CONCRETE BRIDGE DECKS OR WHERE OBSTACLES, SUCH AS CONCRETE BARRIER RAIL, PREVENT PROPER PLACEMENT.

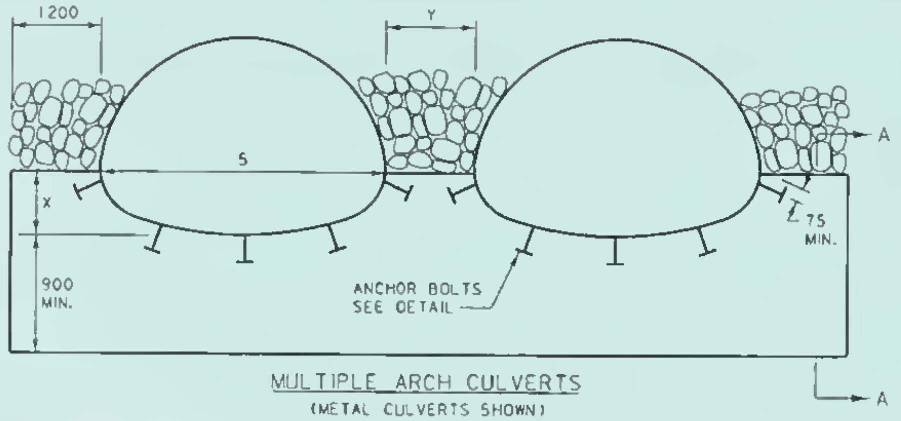
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 411
DWG. NO.
411-02

CONTINUOUS SHOULDER
RUMBLE STRIPS

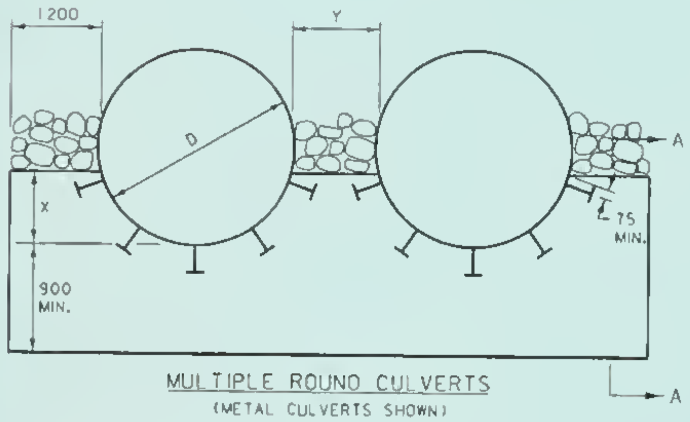
EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

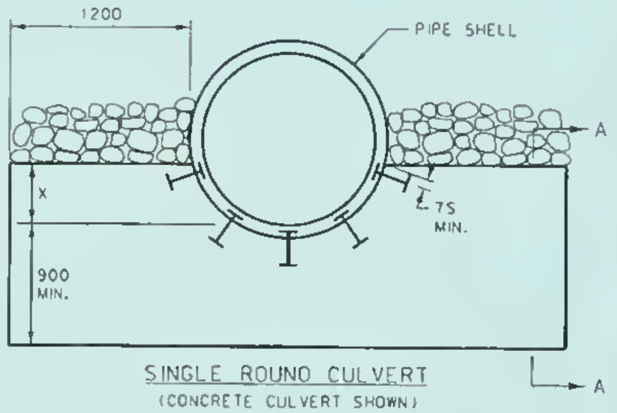


MULTIPLE ARCH CULVERTS
(METAL CULVERTS SHOWN)

X = VARIABLE (SEE DTL. DWG. NO. 603-10 FOR CONCRETE CULV. AND 603-34 FOR METAL CULV.)
Y = 0.5S WITH A MIN. OF 1200 AND A MAX. OF 2400 (OUTSIDE WALL TO OUTSIDE WALL)

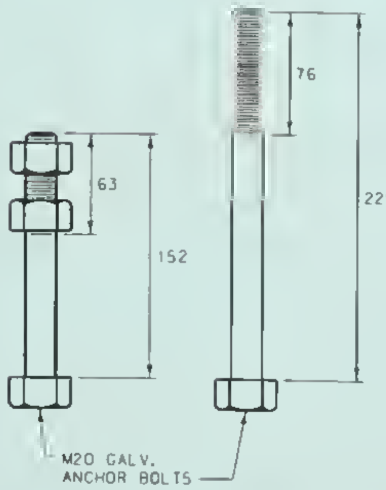


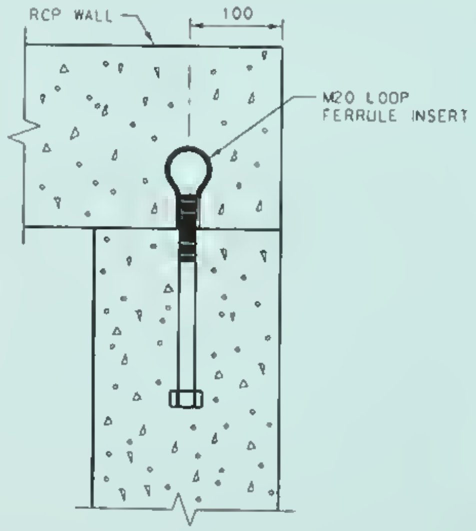
MULTIPLE ROUND CULVERTS
(METAL CULVERTS SHOWN)



SINGLE ROUND CULVERT
(CONCRETE CULVERT SHOWN)

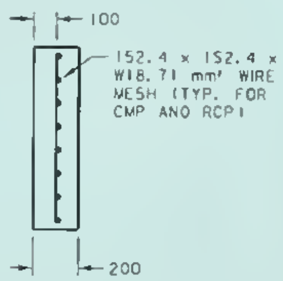
X = VARIABLE (SEE DTL. DWG. NO. 603-08 FOR CONCRETE CULV. AND 603-34 FOR METAL CULV.)
Y = 0.5D WITH A MIN. OF 1200 AND A MAX. OF 2400 (OUTSIDE WALL TO OUTSIDE WALL)





ANCHOR BOLT DETAILS
152 mm LONG FOR METAL PIPE
229 mm LONG FOR CONCRETE PIPE

ANCHOR BOLT SPACING:
MIN. OF FIVE M20 GALV. ANCHOR BOLTS IN WALL. USE MAX. SPACING OF 455 mm.



SECTION A-A

NOTES:

USE CL. "DD" CONCRETE OR EQUAL.

SEE DTL. DWG. NO. 603-18 AND 603-20 FOR BEDDING UNDER CULVERTS.

SEE DTL. DWG. NO. 613-14 FOR RIPRAP.

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 552
DWG. NO.
552-00

CONCRETE CUTOFF WALLS
FOR CULVERTS

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

DIAMETER OR SPAN x RISE (mm)	CUBIC METERS OF CLASS DD CONCRETE (EACH END)								CUBIC METERS OF RIPRAP (EACH END) ① (DTL. DWG. NO. 613-14)						m³ BEDDING MATERIAL ② PER METER OF PIPE (DTL. DWG. NO. 603-18)	
	CUTOFF WALL (DTL. DWG. NO. 552-00)		CONCRETE EDGE PROTECTION (DTL. DWG. NO. 613-08)													
			1.5:1		2:1		2.5:1		1.5:1		2:1		2.5:1			
	SING.	DBL.	SING.	DBL.	SING.	DBL.	SING.	DBL.	SING.	DBL.	SING.	DBL.	SING.	DBL.	SING.	DBL.
RCP (SQ. END)																
1200	0.9	1.6	1.5	2.3	1.8	2.7	~	~	6.2	9.9	7.7	12.3	~	~	2.34	4.68
1350	1.0	1.7	1.7	2.5	2.0	3.0	~	~	6.7	10.8	8.3	13.4	~	~	2.57	5.14
1500	1.1	1.8	1.8	2.7	2.2	3.3	~	~	7.2	11.7	9.0	14.5	~	~	2.80	5.60
1650	1.2	2.0	2.0	3.0	2.4	3.6	~	~	7.7	12.6	9.8	15.9	~	~	3.03	6.06
1800	1.2	2.1	2.2	3.2	2.6	3.9	~	~	8.4	13.7	10.4	17.0	~	~	3.27	6.54
1950	1.3	2.2	2.3	3.5	2.8	4.2	~	~	9.0	14.6	11.1	18.1	~	~	3.52	7.04
2100	1.4	2.4	2.5	3.7	3.0	4.5	~	~	9.5	15.6	11.8	19.3	~	~	3.78	7.56
2250	1.6	2.5	2.6	4.0	3.2	3.8	~	~	15.1	16.5	12.5	20.5	~	~	4.04	8.08
2400	1.5	2.9	2.8	4.2	3.3	5.1	~	~	15.6	17.5	13.2	21.7	~	~	4.31	8.62
RCPA (SQ. END)																
1485 x 915	0.9	1.8	1.6	2.2	1.8	2.7	~	~	6.2	10.1	7.7	12.6	~	~	2.39	4.78
1650 x 1015	0.9	1.5	1.6	2.8	1.4	2.9	~	~	6.7	11.0	8.3	13.6	~	~	2.60	5.20
1855 x 1145	1.0	1.8	1.8	2.7	2.1	3.3	~	~	7.3	12.0	9.0	15.0	~	~	2.84	5.68
2235 x 1370	1.4	1.8	2.1	3.3	2.9	3.9	~	~	9.8	17.5	10.7	17.5	~	~	3.27	6.54
2590 x 1575	1.4	2.0	2.5	3.8	3.0	4.6	~	~	9.8	15.6	12.2	20.5	~	~	3.66	7.32
2920 x 1830	1.8	2.2	2.7	1.4	3.3	5.2	~	~	10.8	18.3	13.3	22.7	~	~	4.15	8.30
3100 x 1960	1.4	2.2	2.9	4.6	3.8	5.6	~	~	11.5	15.6	19.3	24.4	~	~	4.33	8.66
3505 x 2215	1.4	2.7	3.8	5.3	1.4	6.9	~	~	13.1	22.7	16.2	27.8	~	~	4.81	9.62
3910 x 2460	1.5	2.9	3.8	6.1	4.6	1.4	~	~	14.7	25.3	16.2	31.4	~	~	5.31	10.62
4285 x 2705	1.8	2.8	1.6	6.4	3.9	1.8	~	~	15.4	26.7	19.1	33.1	~	~	5.73	11.46

DIAMETER OR SPAN x RISE (mm)	CUBIC METERS OF CLASS DD CONCRETE (EACH END)							CUBIC METERS OF RIPRAP (EACH END) ① (DTL. DWG. NO. 613-14)					SLOPE	m³ BEDDING MATERIAL ② PER LIN. m OF PIPE (DTL. DWG. NO. 603-18)	
	CUTOFF WALL (DTL. DWG. NO. 552-00)		CONCRETE EDGE PROTECTION (DTL. DWG. NO. 613-08)												
	SING.	DBL.		SING.	DBL.				SING.	DBL.				SING.	DBL.
RCP (FETS)															
1200	1.2	2.1		2.2	3.4				10.4	17.5			2.5:1	2.34	4.68
1350	1.3	2.2		2.0	3.1				9.3	15.7			2.0:1	2.57	5.14
1500	1.4	2.4		1.9	2.9				8.8	14.9			1.9:1	2.80	5.60
1650	1.4	2.3		2.2	3.4				9.8	16.7			1.7:1	3.03	6.06
1800	1.5	2.5		2.3	3.7				10.5	17.9			1.8:1	3.27	6.54
1950	1.5	2.6		2.6	4.1				11.6	19.8			1.8:1	3.52	7.04
2100	1.6	2.7		2.7	4.2				11.7	20.1			1.6:1	3.78	7.56
2250	1.7	2.9		2.8	4.5				12.3	21.3			1.5:1	4.04	8.08
RCPA (FETS)															
1485 x 915	1.2	2.0		2.1	3.3				10.8	18.3			3.0:1	2.39	4.78
1650 x 1015	1.3	2.2		2.2	3.4				11.3	19.2			3.0:1	2.60	5.20
1855 x 1145	1.4	2.3		2.3	3.6				11.9	20.4			3.0:1	2.84	5.68
2235 x 1370	1.5	2.6		2.1	3.4				10.4	18.0			2.0:1	3.27	6.54

NOTES:

① QUANTITIES ARE BASED ON A THICKNESS OF 600 mm AND ARE PROPORTIONED WHEN A DIFFERENT THICKNESS IS SPECIFIED.

② QUANTITIES ARE BASED ON NO. 3 FOUNDATION STABILIZATION WITH A WIDTH EQUAL TO (DIAMETER OR SPAN) + 1200 mm + (2 TIMES SHELL THICKNESS FOR CONCRETE OR 2 TIMES CORRUGATION WIDTH FOR METAL) AND A DEPTH EQUAL TO 600 mm PLUS "X". TO COMPUTE THE TOTAL BEDDING QUANTITY MULTIPLY BY LENGTH OF PIPE MINUS [illegible] m.

SEE DTL. DWG. NO. 603-18 FOR DEFINITION OF NO. 3 FOUNDATION STABILIZATION AND "X" DIMENSION.

FOR PIPES WITH SKEW BEVEL ENDS - DIVIDE THE QUANTITIES SHOWN BY COSINE OF SKEW ANGLE.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 552, 603, 613
DWG. NO.
552-04

CONCRETE, RIPRAP AND BEDDING
MATERIAL QUANTITIES FOR SING.
AND DBL. CULVERT INSTALLATION

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

DIAMETER OR SPAN x RISE (m)	CUBIC METERS OF CLASS DD CONCRETE (EACH END)								CUBIC METERS OF RIPRAP① (EACH END) (DTL. DWG. NO. 613-14)						m^3 BEDDING MATERIAL ② PER METER OF PIPE (DTL. DWG. NO. 603-18)	
	CUTOFF WALL (DTL. DWG. NO. 552-00)		CONCRETE EDGE PROTECTION (DTL. DWG. NO. 613-08)													
			1.5:1		2:1		2.5:1		1.5:1		2:1		2.5:1			
	SING.	DBL.	SING.	DBL.	SING.	DBL.	SING.	DBL.	SING.	DBL.	SING.	DBL.	SING.	DBL.	SING.	DBL.
SSPPA 152 mm x 51 mm CORRUGATIONS 457 mm CORNER RADIUS																
1.850 x 1.400	1.0	1.7	1.5	2.2	1.8	2.6	2.1	3.1	6.1	10.0	7.6	12.5	9.2	15.0	2.64	5.28
1.930 x 1.450	1.0	1.8	1.5	2.3	1.8	2.8	2.2	3.3	6.4	10.5	8.0	13.0	9.6	15.7	2.66	5.32
2.060 x 1.500	1.1	1.9	1.6	2.4	1.9	2.9	2.2	3.4	6.6	10.8	8.3	13.6	10.0	16.4	2.83	5.66
2.130 x 1.550	1.1	1.9	1.7	2.5	2.0	3.0	2.4	3.5	6.8	11.2	8.5	14.0	10.4	17.1	2.84	5.68
2.210 x 1.600	1.1	1.9	1.7	2.6	2.1	3.1	2.5	3.7	7.1	11.7	8.8	14.5	10.7	17.5	2.85	5.70
2.340 x 1.650	1.2	2.0	1.8	2.7	2.1	3.2	2.5	3.8	7.4	12.2	9.2	15.2	11.1	18.3	3.03	6.06
2.410 x 1.700	1.2	2.0	1.9	2.8	2.2	3.4	2.6	4.0	7.6	12.5	9.5	15.8	11.5	19.0	3.03	6.06
2.490 x 1.750	1.2	2.0	4.5	2.9	2.9	3.3	2.8	8.1	7.8	18.9	8.2	16.1	18.9	18.9	3.02	6.04
2.620 x 1.800	1.2	2.1	2.0	4.5	2.7	3.3	2.8	4.5	8.4	14.3	16.1	18.9	12.2	20.9	3.82	8.48
2.690 x 1.850	1.2	2.1	2.1	3.1	2.8	4.8	1.3	3.3	6.4	13.2	10.9	14.3	12.5	20.9	3.21	6.82
2.840 x 1.910	1.3	2.2	2.1	3.2	2.8	4.8	4.0	1.3	9.5	14.3	10.9	18.8	18.9	21.7	3.43	6.86
2.900 x 1.960	1.3	2.2	2.2	4.8	2.8	4.0	3.1	1.3	8.9	10.8	17.6	15.4	13.3	22.1	4.41	8.82
2.970 x 2.010	2.8	2.2	2.8	4.8	2.7	8.1	3.2	4.0	8.1	16.1	11.4	18.0	13.2	22.9	3.37	6.74
3.120 x 2.060	2.8	2.3	2.8	4.8	2.8	1.3	4.8	6.6	9.5	15.7	17.6	18.9	10.9	23.4	3.82	7.24
3.250 x 2.110	2.8	2.4	2.8	4.8	2.8	1.3	4.8	5.2	9.5	18.9	18.9	18.8	18.9	20.9	3.85	7.70
3.330 x 2.160	1.3	2.3	2.7	4.6	2.8	4.5	4.8	5.4	9.5	16.5	12.2	20.9	18.9	20.9	3.43	7.66
3.480 x 2.210	1.5	2.8	2.9	4.5	3.3	1.3	4.8	5.5	10.9	18.9	12.3	20.9	18.9	25.2	4.05	8.16
3.530 x 2.260	1.5	2.5	2.8	1.5	3.1	4.8	5.4	5.4	14.3	18.9	18.8	21.6	18.9	26.0	4.05	8.40
3.610 x 2.310	2.8	2.5	2.7	8.1	3.2	5.0	4.5	5.2	10.6	17.6	13.2	22.2	15.4	26.8	4.41	8.02
3.760 x 2.360	1.5	2.2	2.7	1.2	1.3	5.4	4.5	5.4	10.8	18.9	18.9	22.7	16.1	27.3	4.24	8.54
3.810 x 2.410	4.5	2.8	1.3	4.8	3.3	5.2	4.5	6.6	16.1	18.9	18.9	23.4	18.8	28.1	4.24	8.48
3.860 x 2.460	4.8	2.6	1.3	4.8	3.3	5.4	1.3	4.8	18.9	18.9	18.9	24.0	17.1	28.9	4.76	8.36
3.910 x 2.540	1.5	2.8	4.5	4.5	3.6	6.6	1.3	6.6	17.6	19.9	17.6	24.7	17.6	29.7	4.12	7.24
4.090 x 2.570	1.3	2.8	3.5	1.3	3.6	1.3	2.8	6.7	12.0	20.9	18.8	28.9	17.6	30.3	4.41	8.82
SSPPA 152 mm x 51 mm CORRUGATIONS 787 mm CORNER RADIUS																
4.040 x 2.840	4.8	3.2	2.8	1.3	5.4	1.3	4.0	6.3	18.9	18.9	18.9	29.6	16.1	28.9	5.23	10.46
4.110 x 2.900	4.8	3.2	2.8	4.8	4.5	6.6	1.3	6.5	18.9	14.3	14.2	20.9	17.1	20.9	5.19	10.38
4.270 x 2.950	4.8	3.3	2.8	4.7	4.5	6.6	4.8	9.5	18.9	14.3	13.5	20.9	18.9	20.9	5.46	10.92
4.320 x 3.000	4.8	3.3	3.1	4.8	3.1	5.2	8.1	15.4	18.9	20.9	18.0	29.7	16.1	31.0	5.39	10.78
4.390 x 3.050	4.8	3.3	3.2	6.0	4.5	4.0	4.5	7.1	12.3	21.2	15.4	26.8	18.6	31.8	5.34	10.68
4.550 x 3.100	2.2	3.3	3.2	6.0	3.3	4.8	4.8	8.2	12.5	21.5	18.9	20.9	18.9	32.2	6.86	11.32
4.670 x 3.150	2.1	3.6	3.2	5.4	3.3	8.1	4.5	7.3	12.8	21.7	15.7	24.9	18.9	32.6	5.98	11.96
4.750 x 3.200	2.0	3.6	3.3	5.4	4.0	5.4	4.5	7.8	13.1	24.9	16.3	24.9	18.9	33.7	5.90	11.80
4.830 x 3.250	2.2	3.6	3.3	1.3	4.8	6.6	5.0	7.8	13.5	20.9	18.8	20.9	20.9	33.7	6.82	11.64
4.950 x 3.300	2.7	3.7	3.3	5.5	4.8	6.6	1.3	7.8	17.6	20.9	18.8	20.9	20.3	35.0	8.48	12.38
5.030 x 3.350	2.7	3.3	4.8	5.4	1.3	5.4	1.3	8.2	18.9	24.1	11.4	20.9	20.9	36.1	8.40	12.20
5.180 x 3.400	2.8	3.3	4.8	6.6	1.3	4.8	1.3	8.2	16.1	20.9	17.6	30.3	20.9	38.8	5.98	12.90
5.230 x 3.450	2.2	4.8	3.3	6.6	4.5	4.8	5.3	8.5	18.9	25.0	18.9	31.0	21.7	37.4	5.90	12.80
5.310 x 3.510	2.7	3.3	3.3	6.1	1.3	1.3	1.3	8.8	14.3	29.7	18.9	32.0	22.9	38.8	6.30	12.60
5.460 x 3.560	2.2	3.5	3.3	6.2	1.3	1.5	5.5	8.9	45.1	20.9	18.8	38.8	22.6	39.2	6.82	13.24
5.510 x 3.610	2.2	3.6	4.0	6.2	4.8	1.3	1.3	8.4	14.3	20.9	13.2	33.3	23.2	15.2	6.55	13.10
5.660 x 3.660	2.8	2.1	4.0	6.5	4.8	1.3	1.3	8.2	18.8	27.1	18.9	33.7	23.4	40.6	6.82	13.84
5.720 x 3.710	2.7	2.1	4.8	6.6	6.0	4.0	1.3	9.5	16.1	27.8	14.3	34.6	20.9	18.9	6.82	13.84
5.870 x 3.760	2.7	4.2	1.2	6.7	6.0	4.8	6.0	8.8	15.2	20.9	20.1	35.0	24.9	32.2	7.78	14.38
5.940 x 3.810	2.7	4.2	1.3	1.5	5.2	5.4	6.2	9.5	18.9	20.9	20.9	36.0	20.9	18.9	2.05	14.18
5.990 x 3.860	2.3	4.2	4.4	7.1	5.3	8.6	6.3	10.2	17.0	29.6	21.2	36.8	25.5	44.3	7.02	14.04
6.070 x 3.910	2.3	4.1	4.5	7.3	5.5	8.8	6.5	10.5	17.5	30.3	21.7	37.6	26.2	45.4	6.90	13.80
6.220 x 3.960	2.4	4.3	4.6	7.4	5.5	8.9	6.6	10.6	17.6	30.7	21.9	38.2	26.4	46.0	7.29	14.58
6.270 x 4.010	2.4	4.3	4.7	7.5	5.7	9.1	6.7	10.8	18.0	31.3	22.4	38.9	27.0	46.9	7.20	14.40

NOTES:

① QUANTITIES ARE BASED ON A THICKNESS OF 600 mm AND ARE PROPORTIONED WHEN A DIFFERENT THICKNESS IS SPECIFIED.

② QUANTITIES ARE BASED ON NO. 3 FOUNDATION STABILIZATION WITH A WIDTH EQUAL TO (DIAMETER OR SPAN) + 1200 mm + (2 TIMES SHELL THICKNESS FOR CONCRETE OR 2 TIMES CORRUGATION WIDTH FOR METAL) AND A DEPTH EQUAL TO 600 mm PLUS "X". TO COMPUTE THE TOTAL BEDDING QUANTITY MULTIPLY BY (LENGTH OF PIPE MINUS 7.0 m).

SEE DTL. DWG. NO. 603-18 FOR DEFINITION OF NO. 3 FOUNDATION STABILIZATION AND "X" DIMENSION.

FOR PIPES WITH SKEW BEVEL ENDS - DIVIDE THE QUANTITIES SHOWN BY COSINE OF SKEW ANGLE.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 552, 603, 613
DWG. NO.
552-06

CONCRETE, RIPRAP AND BEDDING
MATERIAL QUANTIES FOR SING.
AND DBL. CULVERT INSTALLATION

EFFECTIVE: AUGUST 1999

MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

DIAMETER OR SPAN x RISE (mm OR m)	CUBIC METERS OF CLASS DD CONCRETE (EACH END)								CUBIC METERS OF RIPRAP① (EACH END) (DTL. DWG. NO. 613-14)						m^3 BEDDING MATERIAL ② PER METER OF PIPE (DTL. DWG. NO. 603-18)	
	CUTOFF WALL (DTL. DWG. NO. 552-00)		CONCRETE EDGE PROTECTION (DTL. DWG. NO. 613-08)													
			1.5:1		2:1		2.5:1		1.5:1		2:1		2.5:1			
	SING.	DBL.	SING.	DBL.	SING.	DBL.	SING.	DBL.	SING.	DBL.	SING.	DBL.	SING.	DBL.	SING.	DBL.
CSP 75 mm x 25 mm OR 125 mm x 25 mm CORRUGATIONS																
1350	0.9	1.4	1.5	2.2	1.8	2.6	~	~	6.1	9.7	7.5	12.0	~	~	2.09	4.18
1500	0.9	1.5	1.6	2.4	2.0	2.9	~	~	6.5	10.4	8.1	13.0	~	~	2.27	4.54
1650	1.0	1.6	1.8	2.6	2.1	3.1	~	~	7.0	11.2	8.7	13.9	~	~	2.45	4.90
1800	1.0	1.7	1.9	2.8	2.3	3.4	~	~	7.4	12.0	9.2	14.9	~	~	2.63	5.26
1950	1.1	1.8	2.0	3.0	2.5	3.6	~	~	7.9	12.8	9.8	15.8	~	~	2.82	5.64
2100	1.1	1.9	2.2	3.2	2.6	3.9	~	~	8.4	13.6	10.4	16.8	~	~	3.01	6.02
2250	1.2	2.0	2.3	3.5	2.8	4.2	~	~	8.8	14.4	11.1	18.2	~	~	3.20	6.40
2700	1.3	2.2	1.3	3.3	4.5	1.3	~	~	8.9	14.3	18.9	18.9	~	~	3.40	6.80
2700	1.3	2.8	2.8	3.3	3.2	1.3	~	~	8.9	14.3	12.3	20.2	~	~	3.61	7.22
2700	4.8	2.7	2.1	1.3	2.8	6.6	~	~	10.9	16.1	12.3	20.9	~	~	3.82	7.64
2700	4.8	2.5	2.8	2.8	4.8	1.3	~	~	10.9	18.9	17.6	22.9	~	~	4.03	8.06
3000	1.5	2.8	4.0	1.3	5.4	5.5	~	~	18.9	18.9	18.9	24.9	~	~	4.25	8.50
SSPP 152 mm x 51 mm CORRUGATIONS																
3.205	4.5	2.7	3.3	4.9	4.5	6.8	~	~	12.2	20.1	16.1	24.9	~	~	4.52	9.04
3.360	4.5	2.9	3.3	8.2	8.1	6.3	~	~	18.9	24.9	18.9	26.1	~	~	4.75	9.90
3.515	1.3	3.5	4.8	6.4	1.3	8.9	~	~	13.3	22.9	16.5	27.2	~	~	4.99	9.98
4.910	4.5	8.1	3.7	5.7	4.5	6.3	~	~	13.8	24.9	17.1	28.7	~	~	5.23	10.46
3.825	4.8	8.1	3.9	9.5	1.3	8.2	~	~	10.9	23.9	18.8	29.6	~	~	5.48	10.46
3.515	4.5	3.3	1.3	8.2	1.3	7.8	~	~	18.9	24.9	18.5	30.8	~	~	5.73	11.46
4.135	2.0	3.5	4.8	6.4	5.4	7.6	~	~	18.9	20.3	14.2	32.6	~	~	5.99	11.46
4.290	2.7	3.6	1.3	6.4	5.4	8.1	~	~	16.1	26.8	26.0	33.3	~	~	6.25	12.90
3.825	2.7	4.5	4.5	7.0	1.3	9.5	~	~	16.7	27.8	20.9	34.5	~	~	6.52	13.04
4.600	8.1	4.5	1.3	8.2	6.6	8.9	~	~	14.3	20.9	20.9	35.8	~	~	6.79	13.58
4.755	2.8	1.5	1.3	7.8	6.6	8.4	~	~	18.9	20.3	22.1	37.1	~	~	7.06	14.12
4.910	2.8	1.2	1.3	7.8	5.2	9.5	~	~	18.9	30.9	22.9	38.8	~	~	7.34	14.68
5.065	2.2	1.3	5.2	8.1	1.3	9.5	~	~	18.9	32.8	29.6	33.7	~	~	7.63	15.26
5.220	1.3	4.5	1.3	6.4	6.6	16.1	~	~	18.9	33.1	20.9	31.0	~	~	7.92	15.84
5.375	2.6	1.3	5.5	9.5	6.6	10.9	~	~	20.3	34.2	20.9	42.4	~	~	8.21	16.42
5.530	2.7	4.5	5.9	9.5	4.5	10.8	~	~	20.3	35.3	20.3	33.7	~	~	8.51	17.02
5.865	2.2	1.3	1.3	8.2	1.2	14.2	~	~	27.8	30.9	26.7	45.1	~	~	8.82	17.64
5.375	2.8	5.1	1.3	9.5	4.5	18.9	~	~	20.9	34.5	27.8	18.9	~	~	5.73	18.26
5.995	2.9	5.2	4.5	9.5	7.7	18.9	~	~	22.8	38.6	24.9	47.9	~	~	9.44	18.88
6.150	4.5	5.4	6.5	16.1	7.9	18.9	~	~	23.5	30.9	29.1	18.9	~	~	9.76	19.52
6.305	3.1	5.5	8.1	10.9	8.1	12.7	~	~	24.1	40.9	29.9	50.8	~	~	10.08	20.16
6.460	3.1	1.3	1.3	10.9	6.0	18.9	~	~	20.9	42.1	30.7	52.2	~	~	10.41	20.82
CSPA 68 mm x 13 mm CORRUGATIONS																
1440 x 970	1.3	4.8	4.8	1.3	4.8	2.0	~	~	5.1	8.2	1.3	15.2	~	~	2.05	4.76
1620 x 1100	1.3	4.8	1.3	4.5	1.5	2.7	~	~	1.3	9.5	6.6	18.9	~	~	2.23	4.76
1800 x 1200	1.5	1.3	1.3	2.0	4.8	2.7	~	~	1.3	9.5	1.2	18.8	~	~	2.42	7.64
1950 x 1320	1.5	1.3	4.8	2.2	1.3	2.8	~	~	6.2	10.9	1.3	18.5	~	~	2.58	5.16
2100 x 1450	4.8	4.5	4.5	2.7	4.5	2.7	~	~	6.6	10.9	8.1	18.9	~	~	2.74	5.16
CSPA 75 mm x 25 mm CORRUGATIONS																
1010 x 790	6.6	1.3	1.3	4.0	4.8	1.3	~	~	4.8	6.4	6.3	6.4	~	~	4.76	3.56
1160 x 920	1.3	4.8	4.5	1.5	1.2	4.5	~	~	4.5	7.8	8.8	9.5	~	~	1.98	3.96
1340 x 1050	4.5	1.5	1.2	1.3	1.3	2.1	~	~	5.4	8.1	6.3	16.1	~	~	2.15	4.30
1520 x 1170	1.5	4.5	1.2	1.3	1.5	2.2	~	~	1.3	9.5	6.3	10.9	~	~	2.38	4.76
1670 x 1300	1.5	1.3	4.8	2.2	1.3	2.7	~	~	1.5	8.2	18.9	18.9	~	~	2.59	5.72
1850 x 1400	4.8	4.8	4.6	2.2	1.3	2.8	~	~	6.1	8.9	7.8	12.3	~	~	2.81	5.62
2050 x 1500	4.8	4.5	4.5	2.7	4.5	1.3	~	~	6.6	10.9	8.2	13.5	~	~	2.86	5.72
2200 x 1620	1.2	2.0	1.3	2.8	2.0	3.1	~	~	1.5	18.9	3.1	18.9	~	~	3.07	6.14
2400 x 1720	1.2	2.7	4.8	2.2	2.2	4.8	~	~	1.3	12.2	8.2	15.2	~	~	3.27	6.54
2600 x 1820	1.3	2.2	1.9	2.9	2.3	3.5	~	~	7.8	12.9	9.7	16.1	~	~	3.50	7.00
2840 x 1920	1.4	2.4	2.0	3.1	2.4	3.7	~	~	8.2	13.6	10.1	16.9	~	~	3.72	7.44
2970 x 2020	1.5	2.5	2.1	3.3	2.5	3.9	~	~	8.6	14.3	10.6	17.8	~	~	3.94	7.88
3240 x 2120	1.5	2.6	2.2	3.4	2.7	4.1	~	~	9.0	15.0	11.1	18.7	~	~	4.16	8.32
3470 x 2220	1.6	2.7	2.3	3.6	2.8	4.3	~	~	9.4	15.8	11.6	19.6	~	~	4.38	8.76
3600 x 2320	1.7	2.9	2.4	3.8	2.9	4.6	~	~	9.8	16.5	12.1	20.5	~	~	4.62	9.24

NOTES:

① QUANTITIES ARE BASED ON A THICKNESS OF 600 mm AND ARE PROPORTIONED WHEN A DIFFERENT THICKNESS IS SPECIFIED.

② QUANTITIES ARE BASED ON NO. 3 FOUNDATION STABILIZATION WITH A WIDTH EQUAL TO (DIAMETER OR SPAN) + 1200 mm + (2 TIMES SHELL THICKNESS FOR CONCRETE OR 2 TIMES CORRUGATION WIDTH FOR METAL) AND A DEPTH EQUALTO 600 mm PLUS "X". TO COMPUTE THE TOTAL BEDDING QUANTITY MULTIPLY BY (LENGTH OF PIPE MINUS 7.0 m).

SEE DTL. DWG. NO. 603-18 FOR DEFINITION OF NO. 3 FOUNDATION STABILIZATION AND "X" DIMENSION.

FOR PIPES WITH SKEW BEVEL ENDS - DIVIDE THE QUANTITIES SHOWN BY COSINE OF SKEW ANGLE.

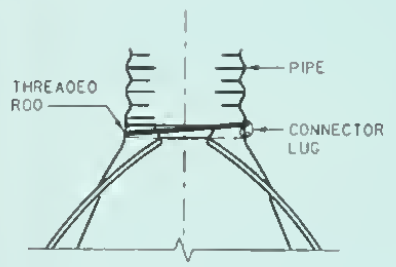
DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 552, 603, 613
DWG. NO.
552-08

CONCRETE, RIPRAP AND BEDDING
MATERIAL QUANTITIES FOR SING.
AND DBL. CULVERT INSTALLATION

EFFECTIVE: AUGUST 1999

MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

CONNECTIONS



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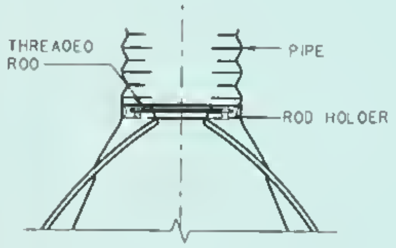

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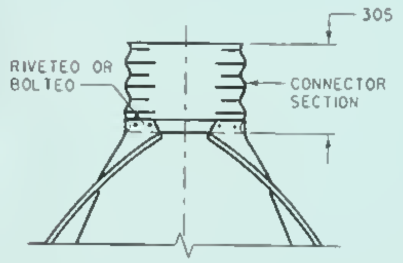
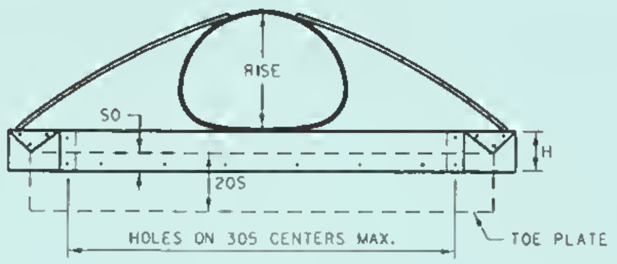
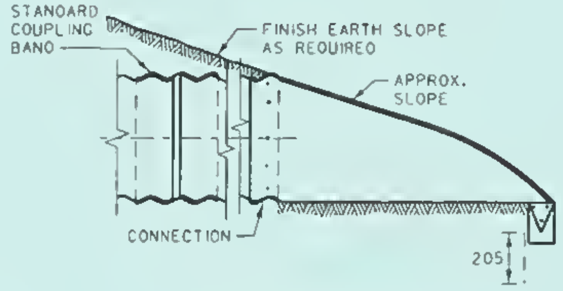


TYPE 3

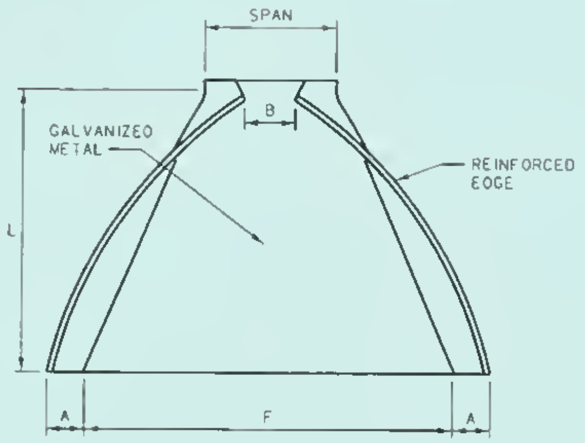
ARCH PIPE



ELEVATION

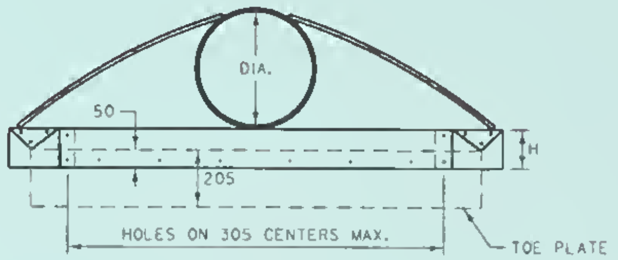


TYPICAL CROSS-SECTION
(ILLUSTRATED WITH TYPE 3 CONNECTION)

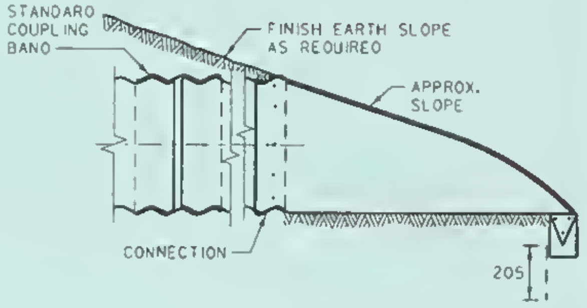


PLAN

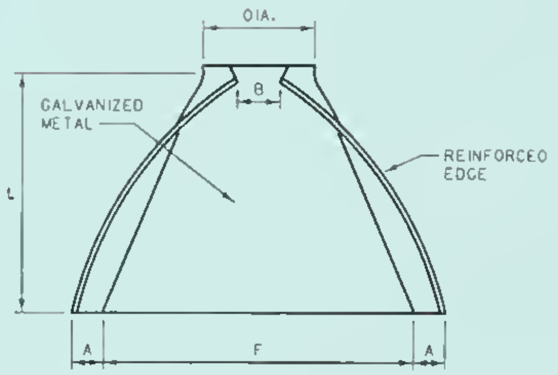
ROUND PIPE



ELEVATION



TYPICAL CROSS-SECTION
(ILLUSTRATED WITH TYPE 3 CONNECTION)



PLAN

SPAN × RISE	MINIMUM THICKNESS *	DIMENSIONS					APPROX. SLOPE	TYPE CONNECTOR
		A 25 TOL.	B MAX.	H 25 TOL.	L 40 TOL.	F 50 TOL.		
68 × 13 CORRUGATIONS								
430 × 330	1.63	130	230	150	510	710	2.13:1	2
530 × 380	1.63	150	280	150	610	860	2:1	2
610 × 460	1.63	180	300	150	710	1020	2.13:1	2
710 × 510	1.63	180	410	150	810	1170	2:1	2
885 × 610	2.01	230	410	150	990	1470	1.88:1	2
1060 × 740	2.01	280	460	180	1170	1850	1.88:1	3
1240 × 840	2.77	300	530	230	1350	2080	1.75:1	3
1440 × 970	2.77	410	660	300	1570	2240	1.88:1	3
1620 × 1100	2.77	430	760	300	1750	2540	1.88:1	3
1800 × 1200	2.77	430	910	300	1960	2840	1.88:1	3
1950 × 1320	2.77	430	910	300	1960	3150	1.63:1	3
2100 × 1450	2.77	430	1120	300	1960	3300	1.5:1	3
75 × 25 CORRUGATIONS								
1340 × 1050	2.77	430	660	300	1600	2240	1.75:1	3
1520 × 1170	2.77	430	910	300	1780	2540	1.88:1	3
1670 × 1300	2.77	430	910	300	1960	2840	1.75:1	3
1850 × 1400	2.77	430	910	300	1960	3150	1.5:1	3
2050 × 1500	2.77	430	1120	300	1960	3450	1.63:1	3

PIPE DIA.	MINIMUM THICKNESS *	DIMENSIONS					APPROX. SLOPE	TYPE CONNECTOR
		A 25 TOL.	B MAX.	H 25 TOL.	L 40 TOL.	F 50 TOL.		
300	1.63	125	180	150	535	560	2.25:1	1
375	1.63	150	205	150	660	710	2.25:1	1
450	1.63	180	255	150	785	865	2.13:1	1
525	1.63	205	305	150	915	1015	2.13:1	1
600	1.63	230	330	150	1040	1170	2.13:1	1
750	2.01	280	405	205	1295	1395	2.13:1	2
900	2.01	330	485	230	1525	1780	2:1	2
1050	2.77	380	635	255	1755	2085	2.13:1	3
1200	2.77	430	735	305	1980	2235	2:1	3
1350	2.77	430	840	305	2135	2540	2:1	3
1500	2.77	430	915	305	2210	2845	1.88:1	3
1650	2.77	430	990	305	2210	2995	1.63:1	3
1800	2.77	430	1120	305	2210	3050	1.5:1	3
1950	2.77	430	1220	305	2210	3300	1.38:1	3
2100	2.77	430	1320	305	2210	3455	1.33:1	3

* THICKNESSES SHOWN ARE FOR STEEL CULVERTS. FOR THICKNESS OF ALUMINUM, SUBTRACT 0.10 mm.

NOTES:

PROVIDE TOE PLATE WHEN SPECIFIED.

GALVANIZE ALL PARTS IN ACCORDANCE WITH AASHTO M 36M.

PAINT ANY AREAS WHERE GALVANIZING IS BROKEN OR METAL IS BARE WITH ONE COAT OF ZINC CHROMATE PRIME AND TWO COATS OF ALUMINUM PAINT.

MINOR VARIATIONS IN DESIGN MAY BE ACCEPTABLE ON APPROVAL OF THE ENGINEER.

SEAMS OR JOINTS LENGTHWISE OF THE APRON ARE ACCEPTABLE IF SECURELY BOLTED OR WELDED AND PAINTED AS PROVIDED ABOVE.

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

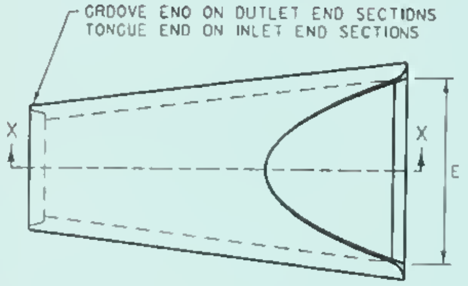
DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 603.709
DWG. NO.
603-02

CMP FLARED END
TERMINAL SECTION
(FETS)

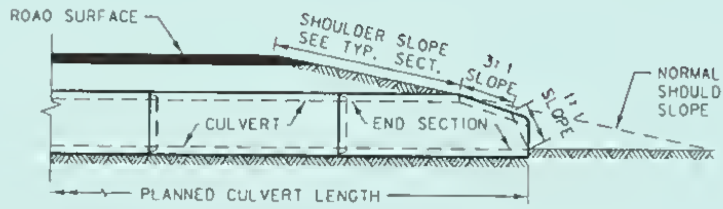
EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

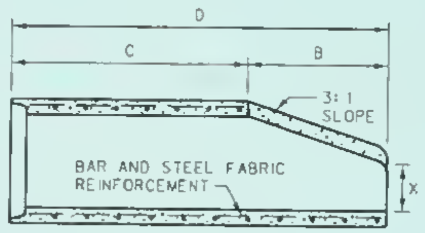
TYPE "A"


GROOVE END ON OUTLET END SECTIONS
TONGUE END ON INLET END SECTIONS
X
X
E

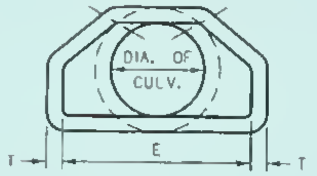
PLAN



SLOPE DETAIL



SECTION X-X

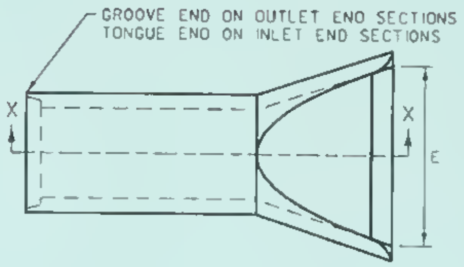


END VIEW

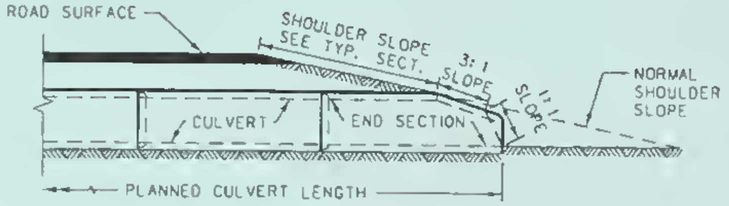
TYPE "A"						
DIA.	X	B	C	D	E	T *
300	101.6	609.6	1228.7	1838.3	609.6	50.8
375	152.4	685.8	1168.4	1854.2	762.0	57.2
450	228.6	685.8	1168.4	1854.2	914.4	63.5
600	241.3	1104.9	762.0	1866.9	1219.2	76.2
750	304.8	1371.6	501.7	1873.3	1524.0	88.9
900	381.0	1600.2	882.7	2482.9	1828.8	101.6
1050	533.4	1600.2	889.0	2489.2	1981.2	114.3
1200	609.6	1828.8	660.4	2489.2	2209.8	127.0
1350	685.8	1651.0	889.0	2540.0	2286.0	139.7

* WALL "B" THICKNESS

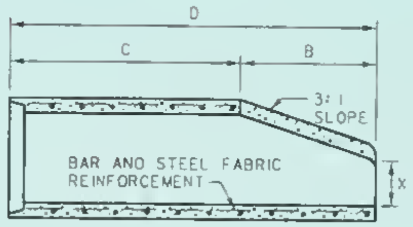
TYPE "B"


GROOVE END ON OUTLET END SECTIONS
TONGUE END ON INLET END SECTIONS
X
X
E

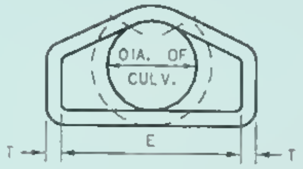
PLAN



SLOPE DETAIL



SECTION X-X



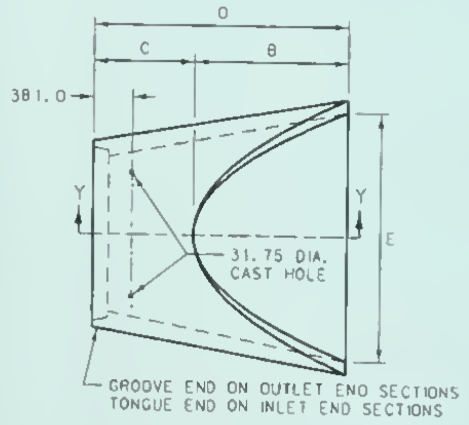
END VIEW

TYPE "B"						
DIA.	X	B	C	D	E	T *
300	101.6	609.6	1241.4	1851.0	609.6	50.8
375	152.4	685.8	1168.4	1854.2	762.0	57.2
450	228.6	685.8	1168.4	1854.2	914.4	63.5
600	241.3	1104.9	762.0	1866.9	1219.2	76.2
750	304.8	1371.6	501.7	1873.3	1524.0	88.9
900	381.0	1600.2	882.7	2482.9	1828.8	101.6
1050	533.4	1600.2	889.0	2489.2	1981.2	114.3
1200	609.6	1828.8	660.4	2489.2	2133.6	127.0
1350	685.8	1651.0	844.6	2495.6	2286.0	139.7

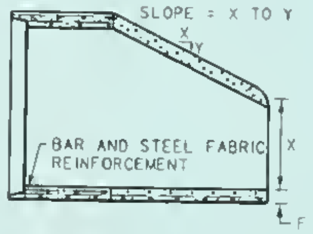
* WALL "B" THICKNESS

TOLERANCES IN THE ADJACENT TABLES MAY NOT VARY MORE THAN ±1.5% FOR THE DIMENSIONS SHOWN. OTHERWISE THEY MUST CONFORM TO AASHTO M 170M.

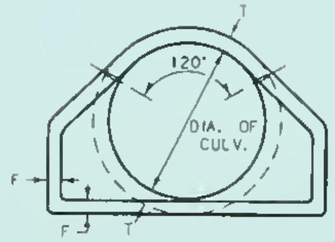
LARGE DIAMETER PIPE


D
C
B
381.0
Y
Y
E
31.75 DIA. CAST HOLE
GROOVE END ON OUTLET END SECTIONS
TONGUE END ON INLET END SECTIONS

PLAN



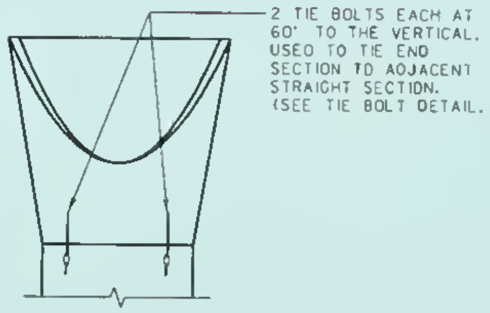
SECTION Y-Y



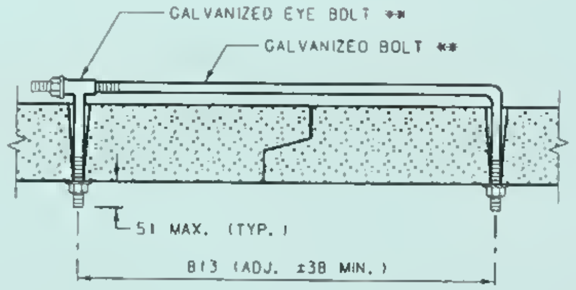
END VIEW

LARGE DIAMETER CULVERT								
DIA.	SLOPE	T *	X	B	C	D	E	F
1500	2:1	152.4	889.0	1524.0	990.6	2514.6	2438.4	127.0
1800	1.86:1	177.8	914.4	1981.2	533.4	2514.6	2743.2	152.4
2100	1.5:1	203.2	914.4	2298.7	533.4	2832.1	3048.0	165.1

* WALL "B" THICKNESS


2 TIE BOLTS EACH AT 60° TO THE VERTICAL. USED TO TIE END SECTION TO ADJACENT STRAIGHT SECTION. (SEE TIE BOLT DETAIL.)

TIE BOLT CONNECTION



** M20 FOR 300 TO 1350 DIA. RCP
M24 FOR 1500 TO 2100 DIA. RCP

TIE BOLT DETAIL
(TWO PER END SECTION)

TIE BOLTS: USE TWO TIE BOLTS ON ALL FLARED END SECTIONS, ONE ON EACH SIDE AT 60° TO THE VERTICAL. GALVANIZE ALL PARTS. SEE TIE BOLT DETAIL.

CONSTRUCTION: CONSTRUCT ACCORDING TO CLASS III, AASHTO M 170M, AS FAR AS DESIGN WILL PERMIT.

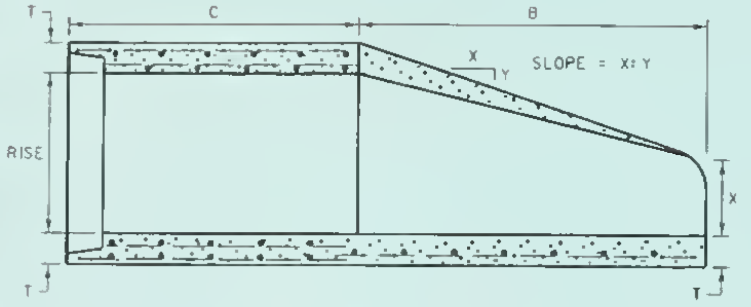
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 603, 708
DWG. NO.
603-08

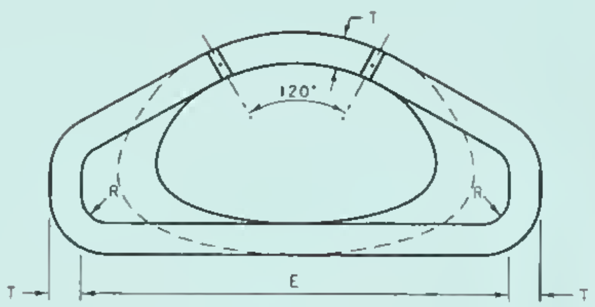
PREFABRICATED RCP
FLARED END TERMINAL
SECTION (FETS)

EFFECTIVE: AUGUST 1999

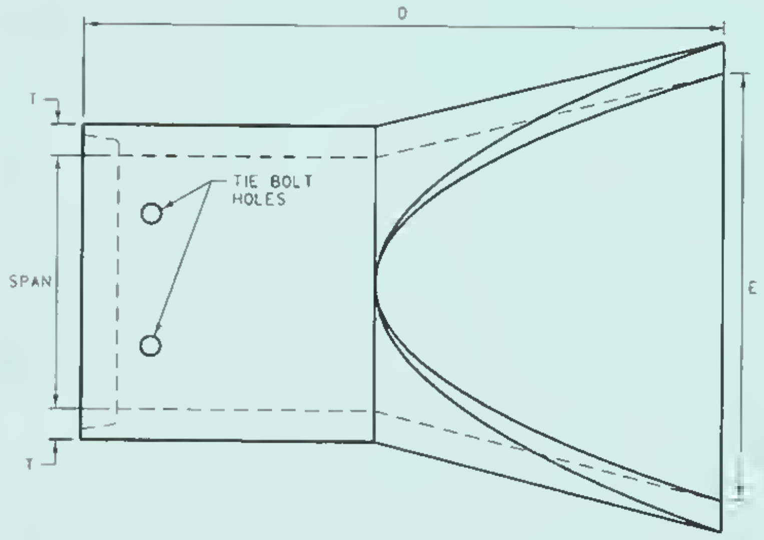
MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



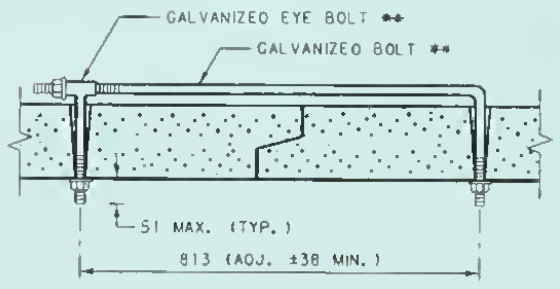
LONGITUDINAL SECTION



END VIEW



PLAN VIEW



** M20 FOR 560 × 345 TO 1650 × 1015 RCPA

M24 FOR 1855 × 1145 TO 2235 × 1370 RCPA

TIE BOLT DETAIL
(TWO PER END SECTION)

TIE BOLTS: USE TIE BOLTS ON ALL FLARED END SECTIONS, ONE ON EACH SIDE AT 60° TO THE VERTICAL. GALVANIZE ALL PARTS. SEE TIE BOLT DETAIL.

CONSTRUCTION: CONSTRUCT ACCORDING TO CLASS A-III, AASHTO M 206M, AS FAR AS DESIGN WILL PERMIT.

SPAN	RISE	T *	X	B	C	D	E	R	SLOPE
560	345	63.5	215.9	1143.0	685.8	1828.8	914.4	76.2	3:1
725	460	76.2	215.9	990.6	838.2	1828.8	1219.2	76.2	3:1
920	570	88.9	241.3	1270.0	1168.4	2438.4	1524.0	76.2	3:1
1110	675	101.6	282.6	1524.0	914.4	2438.4	1828.8	152.4	3:1
1300	795	114.3	401.6	1524.0	914.4	2438.4	1981.2	152.4	3:1
1485	915	127.0	533.4	1524.0	914.4	2438.4	2133.6	152.4	3:1
1650	1015	139.7	647.7	1524.0	914.4	2438.4	2286.0	152.4	3:1
1855	1145	152.4	787.4	1524.0	914.4	2438.4	2438.4	152.4	3:1
2235	1370	177.8	787.4	1524.0	990.6	2514.6	3048.0	152.4	2:1

* WALL "B" THICKNESS

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

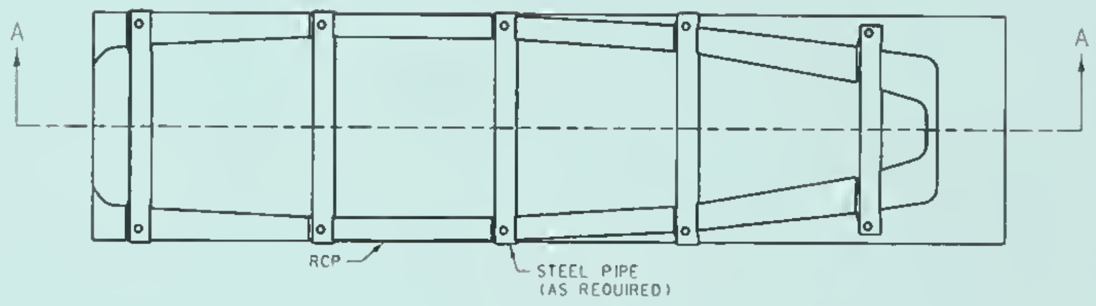
DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 603
DWG. NO.
603-10

PREFABRICATED RCP ARCH
FLARED END TERMINAL
SECTION (FETS)

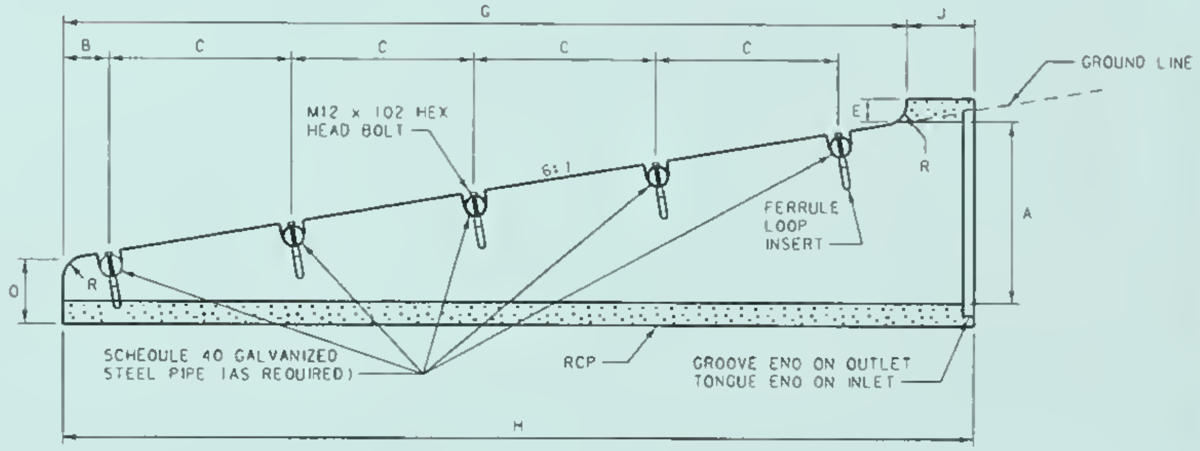
EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

ROAD APPROACH CULVERT END TREATMENT										
QUANTITIES (FOR ESTIMATING ONLY)										
DIA. A RCP	H PIPE LENGTH	M12 × 105 FERRULE LOOP INSERT, EACH	LENGTH 63 DIA. SCHEDULE 40 GALV. PIPE	DIMENSIONS						
				B	C	D	E	G	R	J
375	1448	~	~	~	~	210	82	1219	76	229
450	1981	~	~	~	~	216	76	1752	76	229
600	3048	10	3800	152	610	229	64	2819	76	229

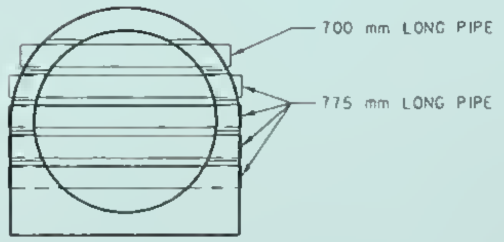


PLAN VIEW

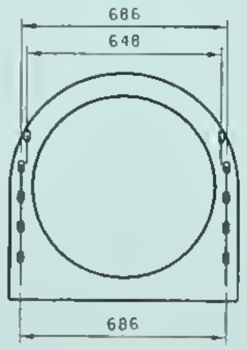

G
J
B
C
C
C
C
GROUND LINE
M12 × 102 HEX HEAD BOLT
E
6:1
R
FERRULE LOOP INSERT
A
D
R
SCHEDULE 40 GALVANIZED STEEL PIPE (AS REQUIRED)
RCP
GROOVE END ON OUTLET TONGUE END ON INLET
H

SECTION A-A

NOTE:
PAINT ALL NON-GALVANIZED PARTS IN ACCORDANCE WITH SECTION 710 OF THE STANDARD SPECIFICATIONS.



END VIEW



VIEW OF INSERTS

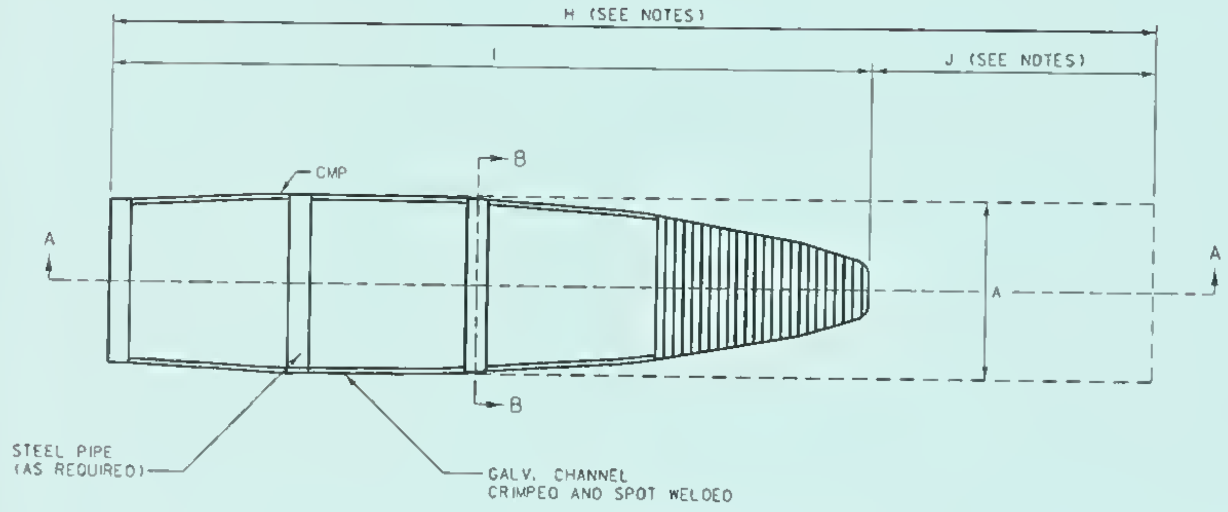
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 603.710
DWG. NO.
603-12

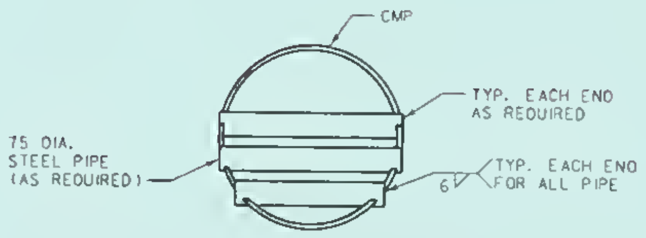
RCP ROAD APPROACH
CULVERT END TREATMENT
(RACET)

EFFECTIVE: AUGUST 1999

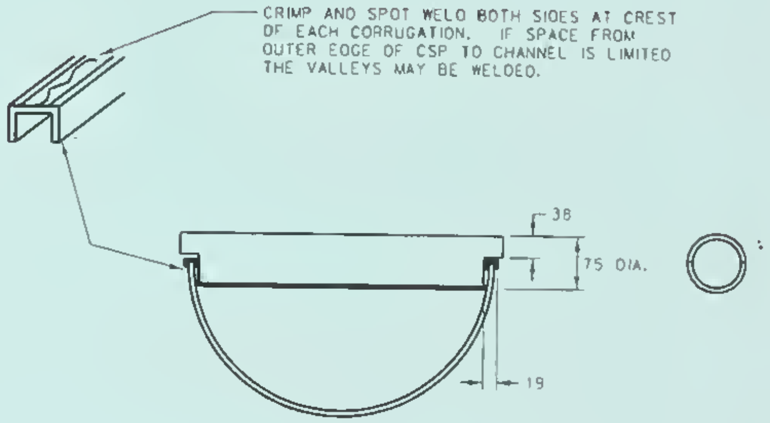
MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



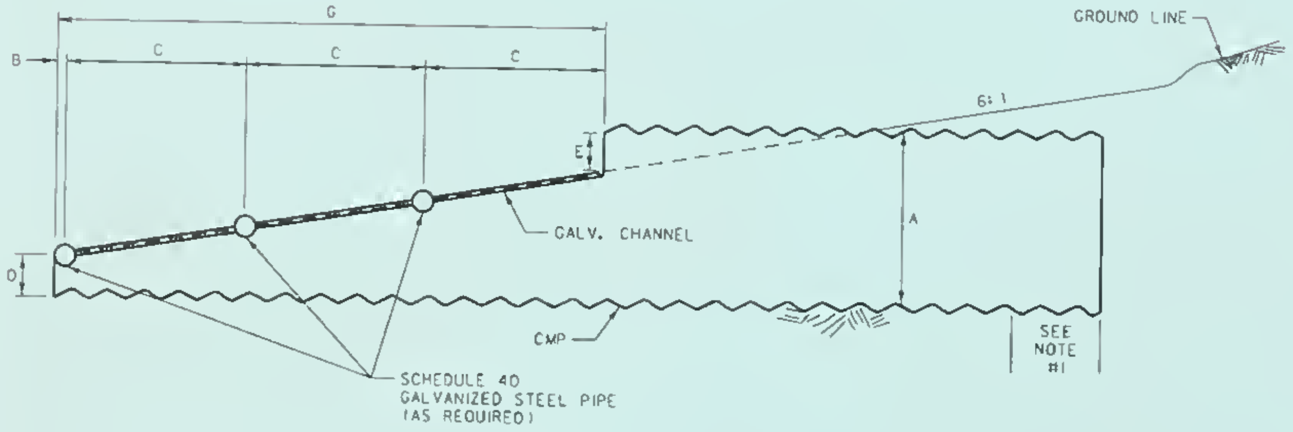
PLAN VIEW



END VIEW


CRIMP AND SPOT WELD BOTH SIDES AT CREST OF EACH CORRUGATION. IF SPACE FROM OUTER EDGE OF CSP TO CHANNEL IS LIMITED THE VALLEYS MAY BE WELDED.
38
75 DIA.
19

SECTION B-B



SECTION A-A

ILLUSTRATED WITH 600 mm CMP (750 mm CMP UTILIZES FOUR GALV. STEEL PIPES)

ROAD APPROACH CULVERT END TREATMENT										
QUANTITIES (FOR ESTIMATING ONLY)										
DIA. A CMP	H PIPE LENGTH	19 x 10 x 3.2 GALV. CHANNEL	LENGTH 75 DIA. SCHEDULE 40 GALV. PIPE	DIMENSIONS						
				B	C	D	E	G	I	J
375	2134	3048	~	~	~	61	61	1524	1829	305
450	2438	3048	~	~	~	101	101	1524	2133	305
600	3048	3656	1800	46	594	152	152	1828	2743	305
750	3810	4874	3000	61	594	183	183	2437	3505	305

NOTES:

1) PIPE TO HAVE ANNULAR CORRUGATION OR REROLLED ENDS. USE ONLY APPROVED COUPLING BAND PER STANDARD SPECIFICATION 709.02 CMP. FOR RCP END TREATMENT. SEE DTL. DWG. NO. 603-26 FOR CONNECTION.

2) THE TWO 19 mm CHANNELS MAY BE ELIMINATED FROM THE CULVERT END TREATMENT IF:

   A. THE CULVERT IS FABRICATED WITH 12 GAGE (2.8 mm THICK) MATERIAL.

   B. HALF CIRCLE NOTCHES ARE CUT IN THE CULVERT FOR THE STEEL PIPE WITH CONTINUOUS WELD OF THE PERIPHERY IN CONTACT PROVIDED.

   C. ALL WELDS AND OTHER NON-GALVANIZED PARTS ARE PAINTED IN ACCORDANCE WITH STANDARD SPECIFICATIONS SECTION 710.

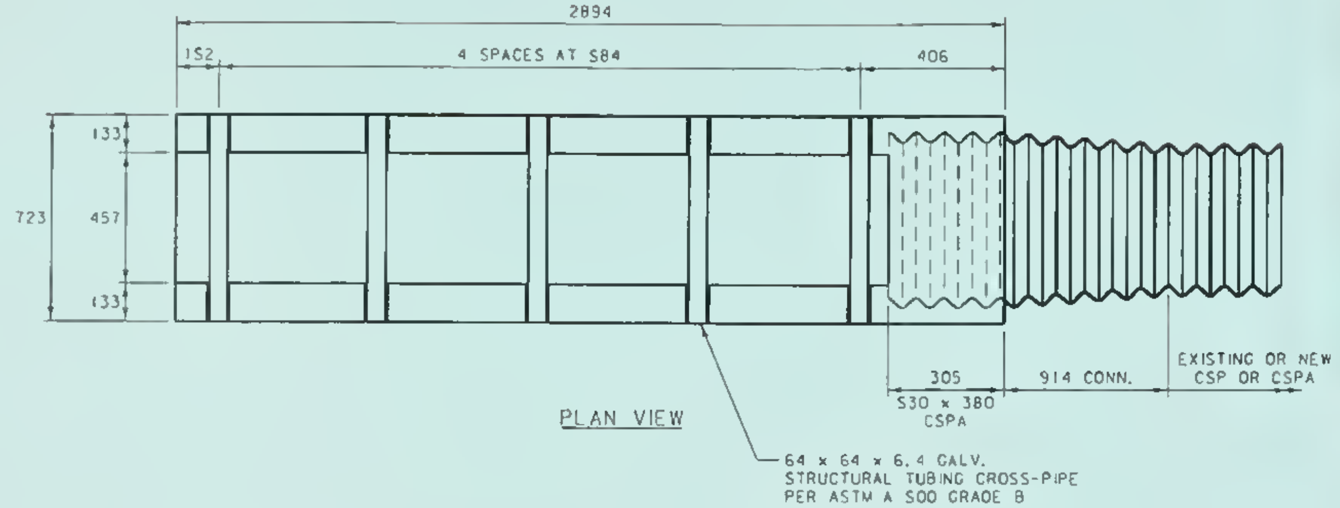
3) CONNECTIONS MADE PER DTL. DWG. NO. 603-26 REQUIRE PIPE LENGTHS H AND J TO BE INCREASED BY 76 mm.

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

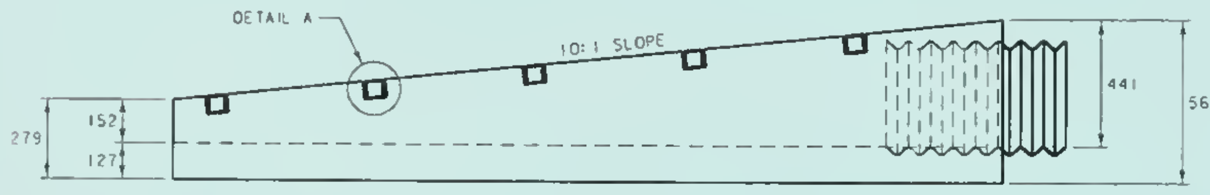
DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 603, 709, 710
DWG. NO.
603-14

CMP ROAD APPROACH
CULVERT END TREATMENT
(RACET)

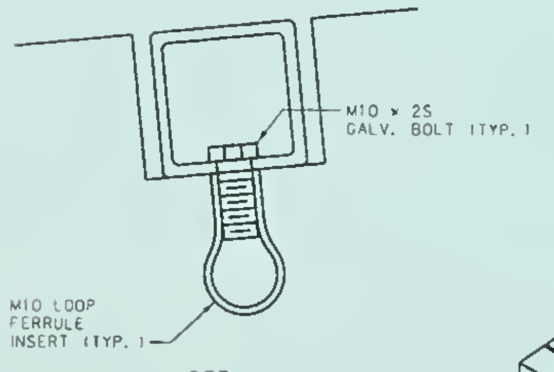
EFFECTIVE: AUGUST 1999
MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD


2894
152
4 SPACES AT 584
406
133
723
457
133
305
914 CONN.
EXISTING OR NEW CSP OR CSPA
530 x 380 CSPA
64 x 64 x 6.4 GALV. STRUCTURAL TUBING CROSS-PIPE PER ASTM A 500 GRADE B

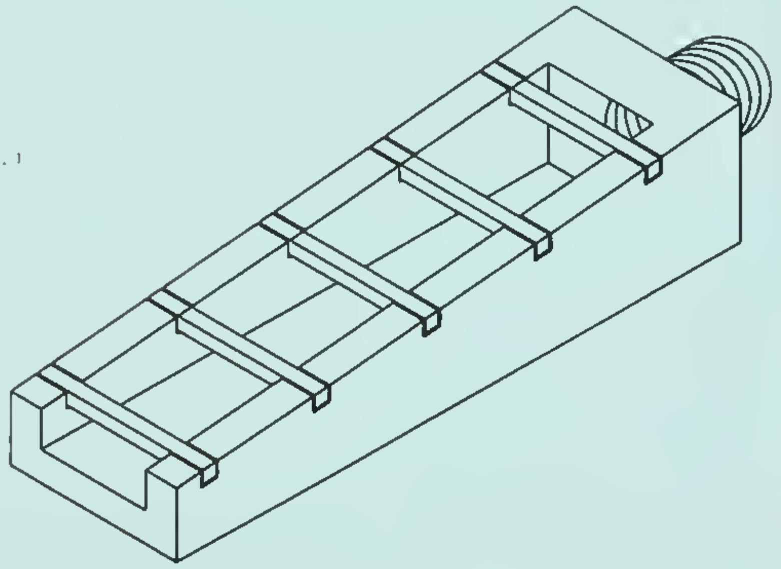
PLAN VIEW



ELEVATION



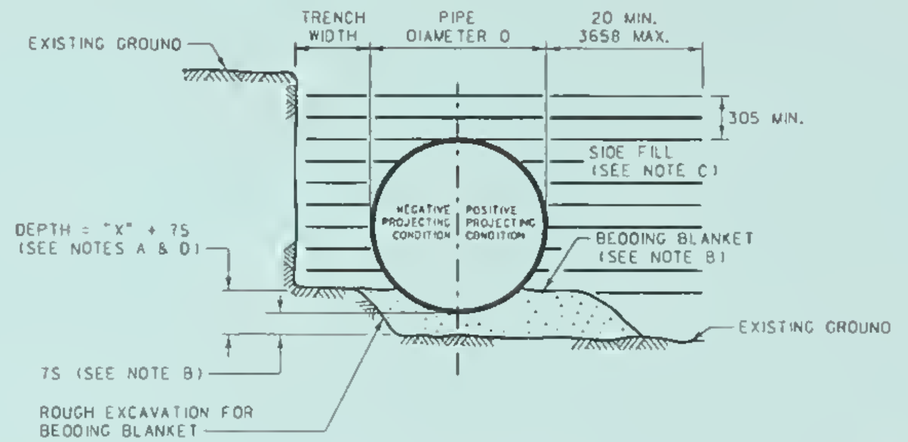
DETAIL A



ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

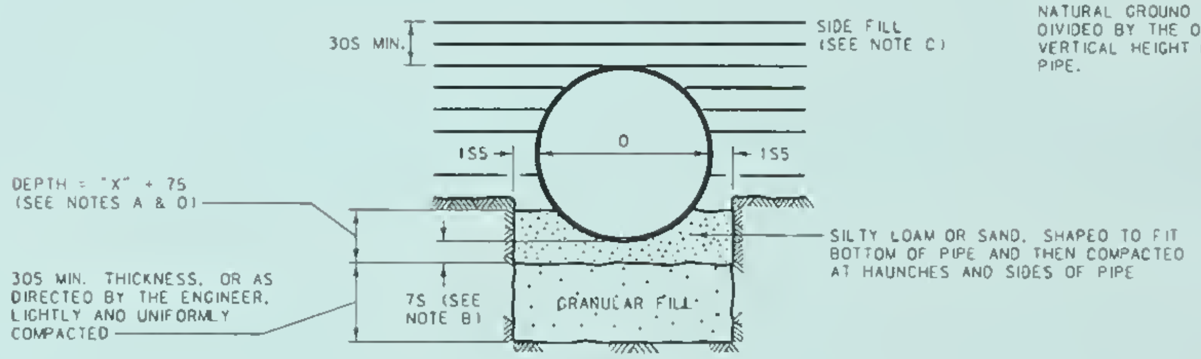
NOTE:
PAINT ALL EXPOSED METAL PARTS WITH ONE COAT OF ZINC RICH PAINT AND TWO COATS OF ALUMINUM PAINT ACCORDING TO STANDARD SPECIFICATION SECTION 710.

DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 603, 708, 710	DWG. NO. 603-17
PRECAST MEDIAN U-TURN CROSS DRAIN AND CONC. BEVELED END	
EFFECTIVE: AUGUST 1999	
MDT MONTANA DEPARTMENT OF TRANSPORTATION	MONTANA CADD

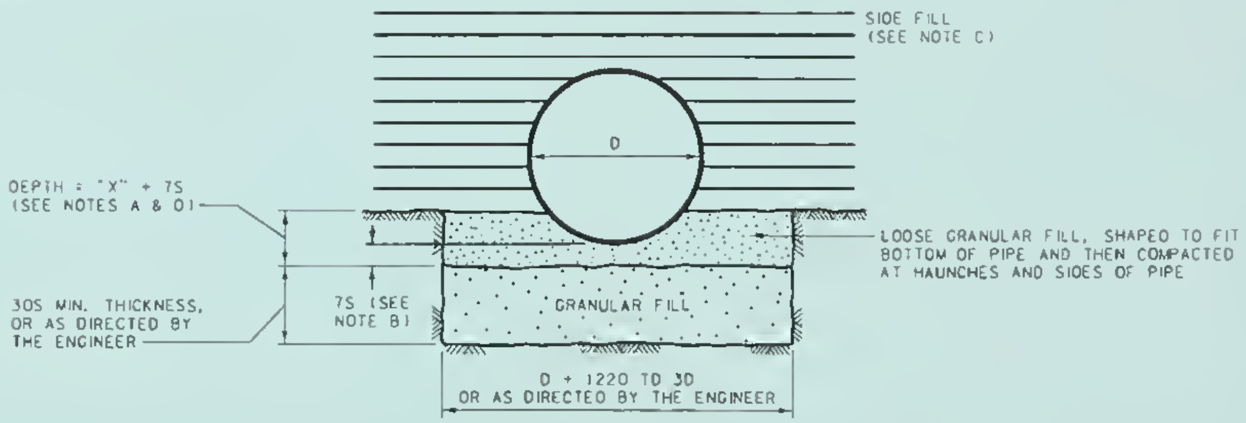

TRENCH WIDTH
PIPE DIAMETER D
20 MIN. 3658 MAX.
EXISTING GROUND
305 MIN.
SIDE FILL (SEE NOTE C)
NEGATIVE PROJECTING CONDITION
POSITIVE PROJECTING CONDITION
DEPTH = "X" + 75 (SEE NOTES A & D)
BEDDING BLANKET (SEE NOTE B)
EXISTING GROUND
75 (SEE NOTE B)
ROUGH EXCAVATION FOR BEDDING BLANKET

1- PIPE INSTALLATION AND BEDDING
(CLASS C, MODIFIED)

NOTE: THE PROJECTION RATIO FOR POSITIVE EMBANKMENT INSTALLATIONS EQUALS THE VERTICAL DISTANCE BETWEEN THE TOP OF THE PIPE AND THE NATURAL GROUND SURFACE DIVIDED BY THE OUTSIDE VERTICAL HEIGHT OF THE PIPE.


305 MIN.
SIDE FILL (SEE NOTE C)
D
155
155
DEPTH = "X" + 75 (SEE NOTES A & D)
SILTY LOAM OR SAND, SHAPED TO FIT BOTTOM OF PIPE AND THEN COMPACTED AT HAUNCHES AND SIDES OF PIPE
305 MIN. THICKNESS, OR AS DIRECTED BY THE ENGINEER, LIGHTLY AND UNIFORMLY COMPACTED
75 (SEE NOTE B)
GRANULAR FILL

2-ROCK


SIDE FILL (SEE NOTE C)
D
DEPTH = "X" + 75 (SEE NOTES A & D)
LOOSE GRANULAR FILL, SHAPED TO FIT BOTTOM OF PIPE AND THEN COMPACTED AT HAUNCHES AND SIDES OF PIPE
305 MIN. THICKNESS, OR AS DIRECTED BY THE ENGINEER
75 (SEE NOTE B)
GRANULAR FILL
D + 1220 TO 30 OR AS DIRECTED BY THE ENGINEER

3-FOUNDATION STABILIZATION

NOTES:

(A) FOR STRUCTURAL PLATE PIPE, THE LENGTH OF BEDDING ARC NEED NOT EXCEED WIDTH OF BOTTOM PLATE.

(B) SHAPE BEDDING BLANKET OF SILTY LOAM OR SAND TO FIT BOTTOM OF PIPE. THE MINIMUM THICKNESS BEFORE PLACING PIPE IS 75 mm.

(C) COMPACT SIDE FILL IN 155 mm LAYERS TO DENSITY SPECIFIED FOR ADJACENT EMBANKMENT. SEE SECTION 203.03.3 OF THE STANDARD SPECIFICATIONS FOR THE DENSITY REQUIREMENTS.

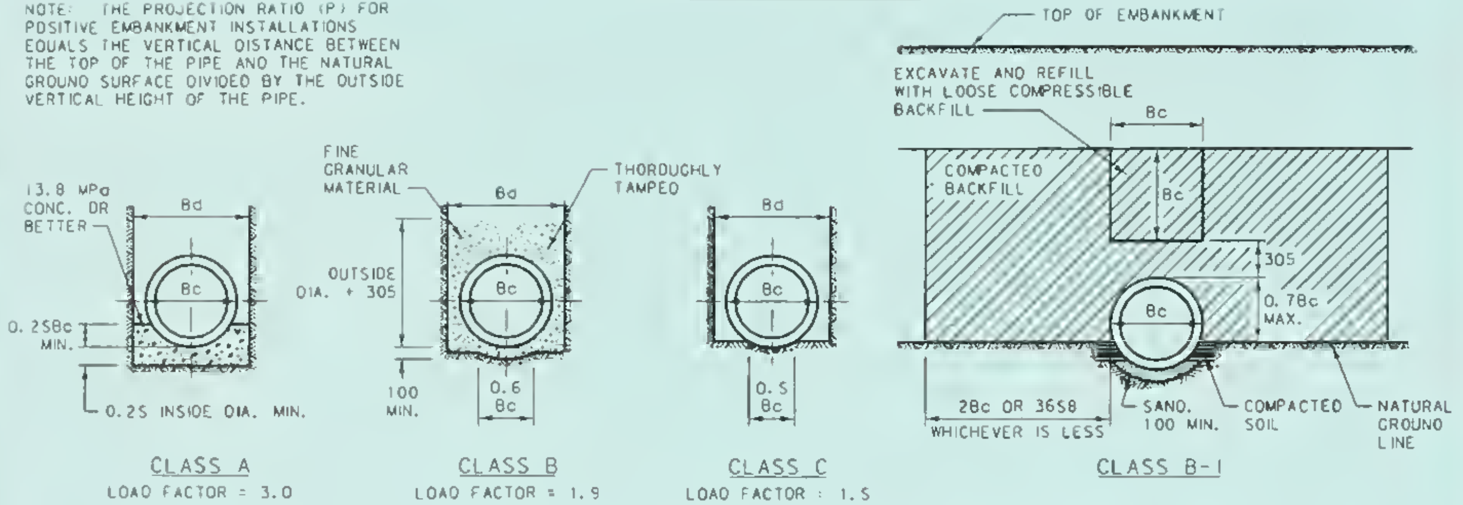
(D) SEE DTL. DWG. NO. 603-08 AND 603-32 FOR "X" DIMENSIONS ON CONCRETE CULVERTS AND DTL. DWG. NO. 603-10 AND 603-34 FOR "X" DIMENSIONS ON METAL CULVERTS.

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

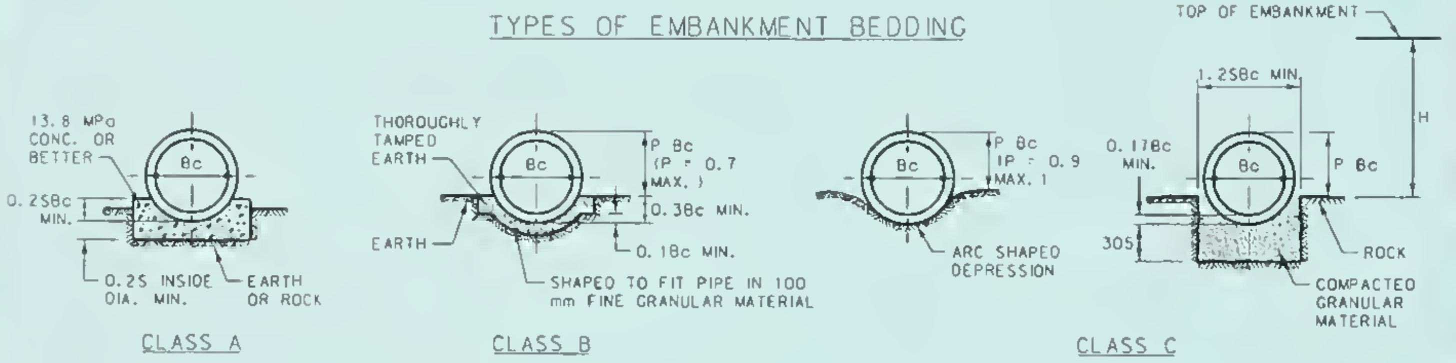
DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 207, 603, 701	DWG. NO. 603-18
CSP AND SSPP CULVERT BEDDING	
EFFECTIVE: AUGUST 1999	
MDT MONTANA DEPARTMENT OF TRANSPORTATION	MONTANA CADD

TYPES OF TRENCH BEDDING

NOTE: THE PROJECTION RATIO (P) FOR POSITIVE EMBANKMENT INSTALLATIONS EQUALS THE VERTICAL DISTANCE BETWEEN THE TOP OF THE PIPE AND THE NATURAL GROUND SURFACE DIVIDED BY THE OUTSIDE VERTICAL HEIGHT OF THE PIPE.



TYPES OF EMBANKMENT BEDDING



DESCRIPTION OF BEDDING CLASSES

CLASS A CONCRETE CRADLE BEDDING.

THE LOWER PART OF THE PIPE EXTERIOR IS BEDDED IN A CONTINUOUS CRADLE CONSTRUCTED OF 13.8 MPa CONCRETE OR BETTER, HAVING A MINIMUM THICKNESS UNDER THE PIPE OF ONE-FOURTH THE NOMINAL INSIDE DIAMETER AND EXTENDING UP THE SIDES OF THE PIPE FOR A HEIGHT EQUAL TO ONE-FOURTH OF THE OUTSIDE DIAMETER. THE CRADLE HAS A MINIMUM WIDTH EQUAL TO THE OUTSIDE DIAMETER OF THE PIPE PLUS 205 mm, AND IS CONSTRUCTED MONOLITHICALLY WITHOUT HORIZONTAL CONSTRUCTION JOINTS.

CLASS B BEDDING

(1) THIS CLASS OF BEDDING FOR EMBANKMENT CONDITIONS IS APPLICABLE ONLY WHEN THE PROJECTION RATIO IS 0.7 AND LESS. THE PIPE IS BEDDED CAREFULLY ON FINE GRANULAR MATERIALS OVER AN EARTH FOUNDATION, ACCURATELY SHAPED BY MEANS OF A TEMPLATE TO FIT THE LOWER PART OF THE PIPE EXTERIOR FOR AT LEAST 10% OF THE CULVERT OVERALL HEIGHT. THEN COMPACTABLE SOIL MATERIAL IS RAMMED AND TAMPED IN LAYERS NOT MORE THAN 155 mm THICK AROUND THE PIPE FOR THE REMAINDER OF THE LOWER 20% OF ITS HEIGHT. BACKFILLING IS COMPLETED TO THE TOP OF THE PIPE, CONFORMING WITH THE APPLICABLE PROVISIONS OF THE STANDARD SPECIFICATIONS.

(2) FOR TRENCH CONDITIONS, THE CULVERT IS PLACED AS DESCRIBED IN B(1) EXCEPT THAT THE EARTH FOUNDATION IS SHAPED TO FIT THE LOWER PART OF THE CULVERT EXTERIOR FOR A WIDTH OF AT LEAST 60% OF THE CULVERT BREADTH. THEN THE REMAINDER OF THE CULVERT IS ENTIRELY SURROUNDED TO A HEIGHT OF AT LEAST 305 mm ABOVE ITS TOP WITH GRANULAR MATERIAL PLACED BY HAND TO FILL ALL SPACES UNDER AND ADJACENT TO THE CULVERT. THE FILL IS TAMPED THOROUGHLY ON EACH SIDE AND UNDER THE CULVERT AS FAR AS PRACTICAL IN LAYERS NOT TO EXCEED 155 mm IN THICKNESS.

CLASS B-1 BEDDING

IN THIS TYPE OF INSTALLATION, SOMETIMES CALLED THE IMPERFECT TRENCH METHOD, THE PIPE CULVERT IS FIRST INSTALLED IN ACCORDANCE WITH THE REQUIREMENTS OF B(2). THEN THE FILL IS COMPACTED AT EACH SIDE OF THE PIPE FOR A LATERAL DISTANCE EQUAL TO TWICE THE OUTSIDE DIAMETER OR 3660 mm, WHICHEVER IS LESS, AND CARRIED UP TO AN ELEVATION ABOVE THE TOP OF THE PIPE EQUAL TO THE OUTSIDE DIAMETER OF THE PIPE PLUS 305 mm. NEXT A TRENCH IS DUG EQUAL IN WIDTH TO THE OUTSIDE DIAMETER OF THE PIPE IN THE FILL DIRECTLY OVER THE CULVERT, DOWN TO AN ELEVATION 305 mm ABOVE THE TOP OF THE PIPE. CARE IS EXERCISED TO KEEP THE SIDES AS VERTICAL AS POSSIBLE. AFTER THE TRENCH IS EXCAVATED, IT IS REFILLLED WITH LOOSE, HIGHLY COMPRESSIBLE SOIL MATERIAL. STRAW, HAY, LEAVES, BRUSH OR SAWDUST MAY BE USED TO FILL THE LOWER ONE-FOURTH TO ONE-THIRD OF THE TRENCH IN ORDER TO INSURE HIGH COMPRESSIBILITY OF THE BACKFILL. THIS BACKFILL OF STRAW, HAY, ETC. MAY NOT BE CARRIED CLOSER THAN 3050 mm TO THE OUTSIDE SLOPE OF THE FILL; THE OUTSIDE 3050 mm IS COMPOSED OF IMPERVIOUS MATERIAL, THOROUGHLY COMPACTED. AFTER THE BACKFILL IS COMPLETED, THE BALANCE OF THE FILL IS CONSTRUCTED BY NORMAL METHODS UP TO THE FINISHED GRADE OF EMBANKMENT.

CLASS C BEDDING

FOR PROJECTING EMBANKMENT CULVERTS, THIS METHOD OF BEDDING IS WITH "ORDINARY" CARE IN AN EARTH FOUNDATION SHAPED IN THE FORM OF AN ARC TO FIT THE LOWER PART OF THE CULVERT EXTERIOR WITH REASONABLE CLOSENESS FOR AT LEAST 10% OF ITS OVERALL HEIGHT. THE REMAINDER OF PIPE IS SURROUNDED BY MATERIAL PLACED BY HAND TOOLS TO COMPLETELY FILL ALL SPACES UNDER AND ADJACENT TO THE PIPE. THEN BACKFILLING IS COMPLETED TO THE TOP AS SPECIFIED IN THE STANDARD SPECIFICATIONS. IF THE CULVERT IS PLACED ON ROCK FOUNDATIONS, PROJECTING EMBANKMENT CULVERT PIPES ARE BEDDED ON AN EARTH CUSHION HAVING A MINIMUM ALLOWABLE THICKNESS OF 305 mm ± WITH THE EARTH FOUNDATION CAREFULLY SHAPED AND FILLED AROUND THE CULVERT THE SAME AS ORDINARY PROJECTING EMBANKMENT BEDDING ON AN EARTH FOUNDATION.

CLASS C-1 BEDDING

THE PIPE IS INSTALLED IN ACCORDANCE WITH CLASS C BEDDING, USING THE IMPERFECT TRENCH METHOD AS DESCRIBED UNDER CLASS B-1 BEDDING.

WHEN NATURAL GROUND MATERIAL SIMULATES BEDDING MATERIAL, NO SPECIAL BEDDING MATERIAL NEED BE USED. CLASS C BEDDING IS USED UNLESS OTHERWISE NOTED ON THE PLANS.

COMPACTION

ALL FOUNDATIONS REQUIRE COMPACTION.

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 207, 603, 701
DWG. NO.
603-20

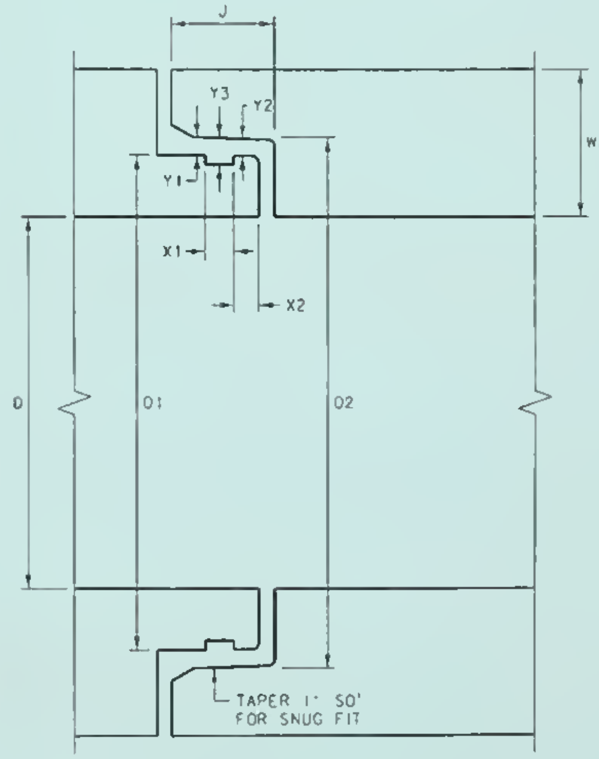
RCP
CULVERT BEDDING

EFFECTIVE: AUGUST 1999

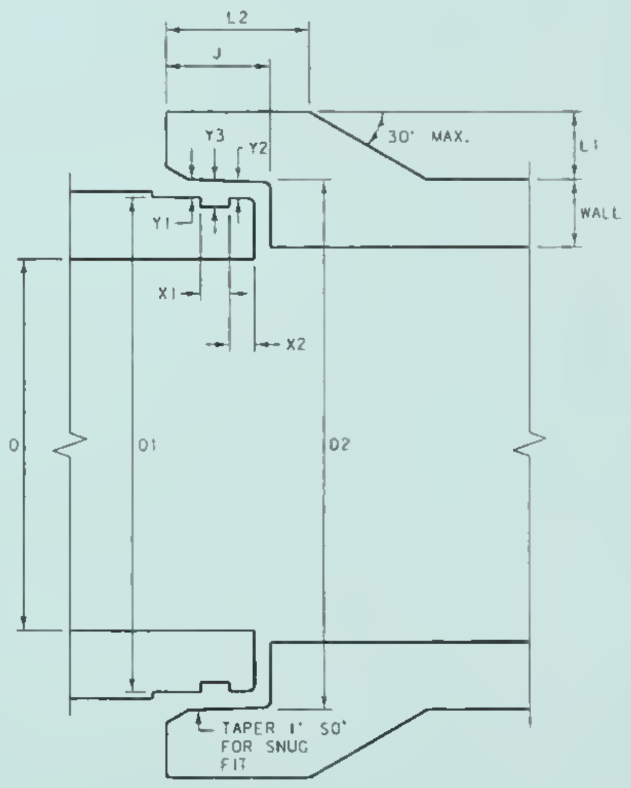
MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

DIA. D	APPROX. DIA. GASKET MATL. NOT STRETCHED	LENGTH OF JOINT J	D1	D2	L2 (MIN.)	L1 (WALL "B")	L1 (WALL "C")	X1	X2	Y1	Y2	Y3
300	16.67	92.08	386.66	389.41	127.00	50.80	~	25.40	22.23	1.57	2.29	7.95
375	16.67	92.08	475.56	478.31	120.65	55.56	~	25.40	22.23	1.57	2.29	7.95
450	16.67	92.08	561.29	564.03	127.00	60.33	~	25.40	22.23	1.57	2.29	7.95
525	16.67	98.43	650.24	653.39	133.35	65.09	~	25.40	22.23	1.57	2.29	7.95
600	16.67	98.43	735.97	739.11	139.70	69.85	50.80	25.40	22.23	1.57	2.29	7.95
675	16.67	101.60	824.89	828.24	139.70	69.85	50.80	25.40	22.23	1.57	2.29	7.95
750	16.67	101.60	913.79	917.14	139.70	69.85	50.80	25.40	22.23	1.57	2.29	7.95
825	16.67	104.78	1002.69	1006.25	146.05	73.03	53.98	25.40	22.23	1.57	2.29	7.95
900	16.67	104.78	1091.59	1095.15	152.40	79.38	60.33	25.40	22.23	1.57	2.29	7.95
1050	19.05	117.48	1274.65	1274.65	171.45	95.25	76.20	30.16	25.40	1.70	3.28	9.55
1200	19.05	120.65	1448.38	1452.70	184.15	104.78	85.73	30.16	25.40	1.70	3.28	9.55
1350	19.05	127.00	1600.38	1605.08	190.50	92.08	73.03	30.16	25.40	1.70	3.28	9.55
1500	19.05	127.00	1752.78	1757.48	190.50	79.38	60.33	30.16	25.40	1.70	3.28	9.55
1650	20.64	127.00	1905.18	1909.88	190.50	69.85	50.80	30.16	25.40	1.70	3.28	9.55
1800	20.64	133.35	2012.95	2016.76	~	~	~	30.16	31.75	2.36	4.83	9.55
1950	20.64	133.35	2190.75	2194.56	~	~	~	30.16	31.75	2.36	4.83	9.55
2100	20.64	133.35	2324.10	2327.91	~	~	~	30.16	31.75	2.36	4.83	9.55
2250	20.64	133.35	2482.85	2486.66	~	~	~	30.16	31.75	2.36	4.83	9.55
2400	20.64	133.35	2647.95	2651.76	~	~	~	30.16	31.75	2.36	4.83	9.55
2550	20.64	133.35	2813.05	2816.86	~	~	~	30.16	31.75	2.36	4.83	9.55
2700	20.64	133.35	2978.15	2981.96	~	~	~	30.16	31.75	2.36	4.83	9.55

1800 DIA. PIPES AND LARGER



1650 DIA. PIPES AND SMALLER



NOTES:

TYPICAL FOR STORM DRAIN AND IRRIGATION APPLICATIONS (FOR HEADS UP TO 6.1 m).

USE RUBBER GASKETS THAT MEET THE REQUIREMENTS OF STANDARD SPECIFICATION 707.02.1.

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 603, 707, 708
DWG. NO.
603-22

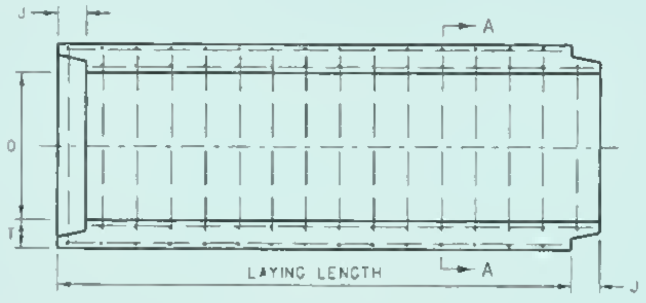
WATER TIGHT JOINT FOR
REINFORCED CONCRETE PIPE

EFFECTIVE: AUGUST 1999

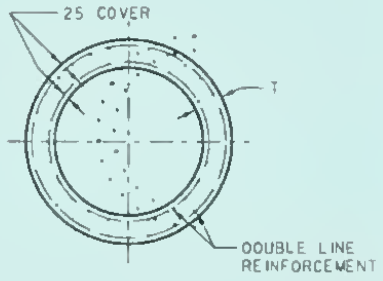
MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

DIA. D	XSEC. WATER AREA (m²)	WT. PER m OF PIPE (kg)	T * MIN. WALL THICKNESS	J LENGTH OF JOINT	A (NOMINAL) = (D2 - D1)/2	D1	D2	D3	D4
300	0.073	136.9	50.8	44.45	4.76	336.55	346.08	352.43	361.95
375	0.114	189.0	57.2	50.80	4.76	419.10	428.63	438.15	447.68
450	0.164	250.0	63.5	57.15	4.76	498.48	508.00	517.53	527.05
525	0.223	318.5	69.9	63.50	4.76	581.03	590.55	603.25	612.78
600	0.292	394.4	76.2	69.85	4.76	660.40	669.93	685.80	695.33
675	0.369	479.2	82.6	76.20	4.76	742.95	752.48	768.35	777.88
750	0.456	571.5	88.9	82.55	4.76	822.33	831.85	850.90	860.43
825	0.552	672.6	95.3	88.90	6.35	901.70	914.40	933.45	946.15
900	0.657	779.8	101.6	95.25	6.35	984.25	996.95	1016.00	1028.70
1050	0.894	1019.4	114.3	101.60	6.35	1146.18	1152.53	1181.10	1193.80
1200	1.167	1290.2	127.0	107.95	6.35	1308.10	1320.80	1346.20	1358.90
1350	1.478	1592.3	139.7	114.30	6.35	1470.03	1482.73	1508.13	1520.83
1500	1.824	1928.7	152.4	127.00	6.35	1631.95	1644.65	1676.40	1689.10
1650	2.207	2294.7	165.1	139.70	6.35	1793.88	1806.58	1841.50	1854.20
1800	2.627	2693.6	177.8	152.40	6.35	1955.80	1968.50	2006.60	2019.30
1950	3.083	3122.2	190.5	165.10	6.35	2117.73	2130.43	2174.88	2192.87
2100	3.575	3586.5	203.2	177.80	6.35	2279.65	2292.35	2339.98	2352.68
2250	4.104	4077.6	215.9	177.80	6.35	2432.05	2444.75	2492.38	2505.08
2400	4.670	4390.1	228.6	177.80	6.35	2593.98	2606.68	2654.30	2667.00
2550	5.272	4576.1	241.3	190.50	6.35	2768.60	2781.30	2832.10	2844.80
2700	5.910	5759.2	254.0	190.50	6.35	2933.70	2946.40	2997.20	3009.90

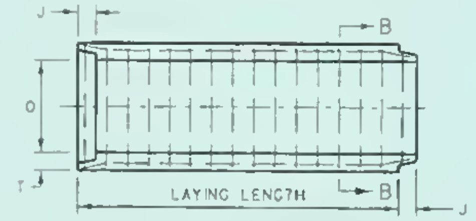
* WALL "B" THICKNESS



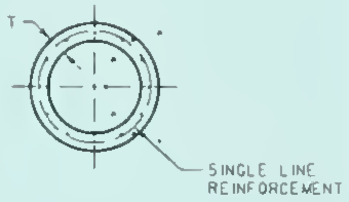
TYPICAL LONGITUDINAL SECTION
900 DIAMETER PIPES AND LARGER



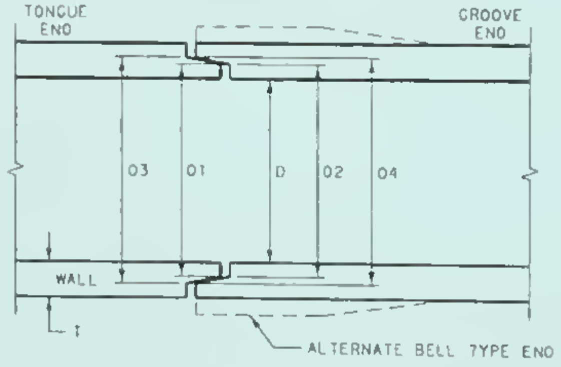
SECTION A-A



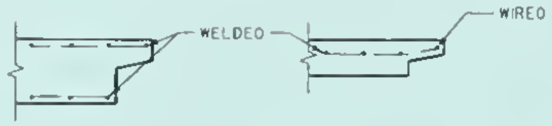
TYPICAL LONGITUDINAL SECTION
825 DIAMETER PIPES AND SMALLER



SECTION B-B



JOINT DETAIL



REINFORCING AT ENDS OF PIPE

NOTES:

TOLERANCES IN DIMENSIONS IN ACCORDANCE WITH AASHTO M 170M.

TYPICAL FOR DRAINAGE APPLICATIONS.

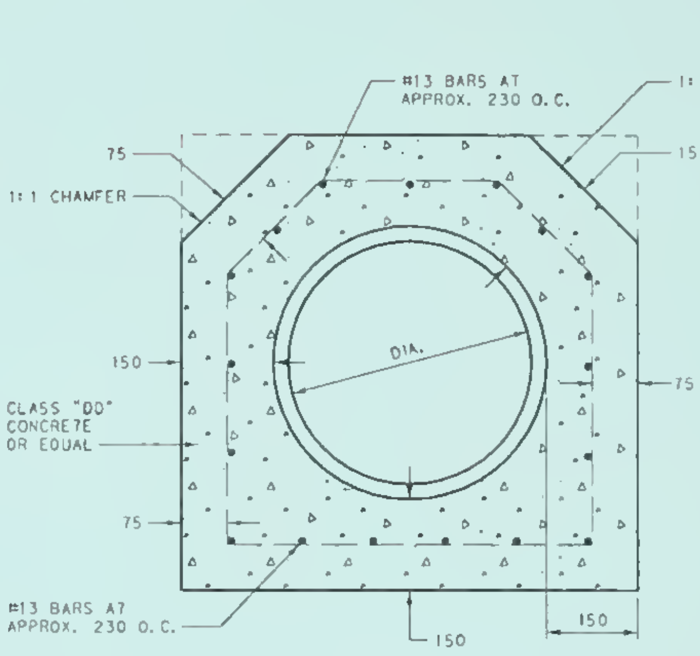
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 603, 708
DWG. NO.
603-24

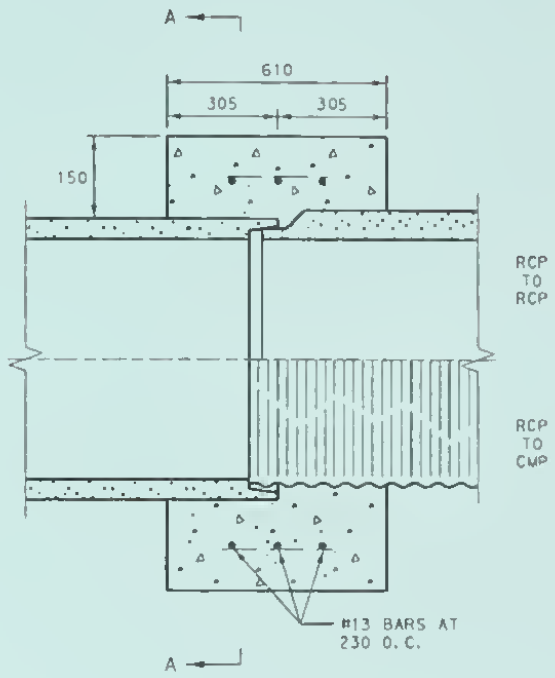
REINFORCED CONCRETE
PIPE JOINT

EFFECTIVE: AUGUST 1999

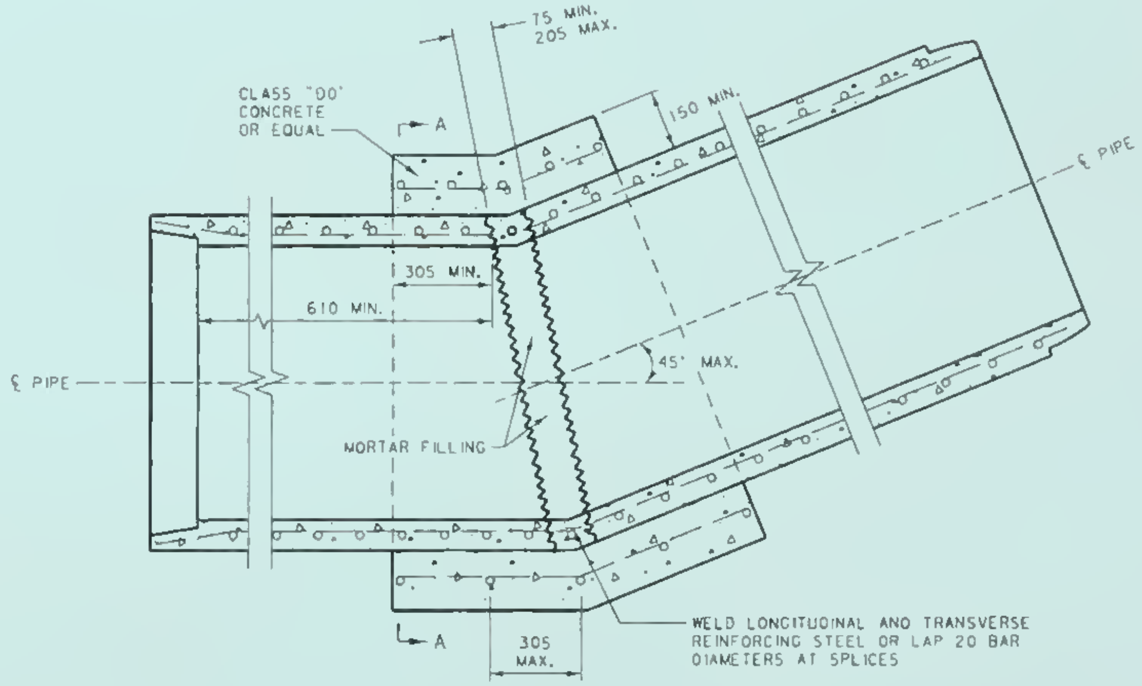
MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD


#13 BARS AT APPROX. 230 O.C.
1:1 CHAMFER
75
1:1 CHAMFER
150
DIA.
150
75
CLASS "DD" CONCRETE OR EQUAL
75
#13 BARS AT APPROX. 230 O.C.
150
150

SECTION A-A



CONNECTION DETAILS


75 MIN.
205 MAX.
CLASS "DD" CONCRETE OR EQUAL
A
150 MIN.
℄ PIPE
305 MIN.
610 MIN.
℄ PIPE
45° MAX.
MORTAR FILLING
A
305 MAX.
WELD LONGITUDINAL AND TRANSVERSE REINFORCING STEEL OR LAP 20 BAR DIAMETERS AT SPLICES

TYPICAL FIELD CAST CONCRETE BEND

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 603, 708
DWG. NO.
603-26

TYPICAL FIELD CAST
CONCRETE CONNECTIONS

EFFECTIVE: AUGUST 1999

MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

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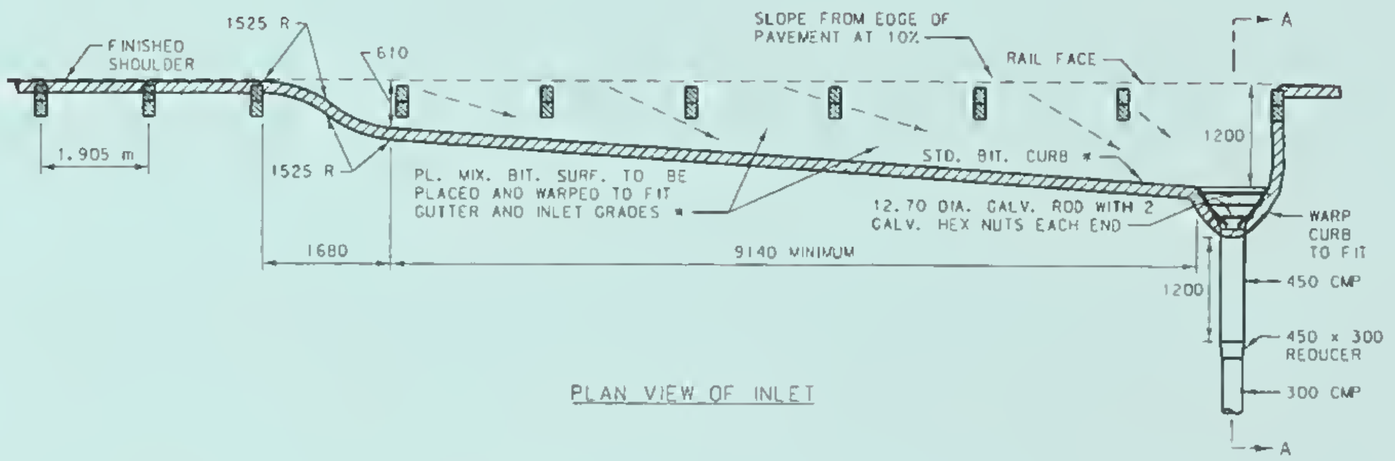
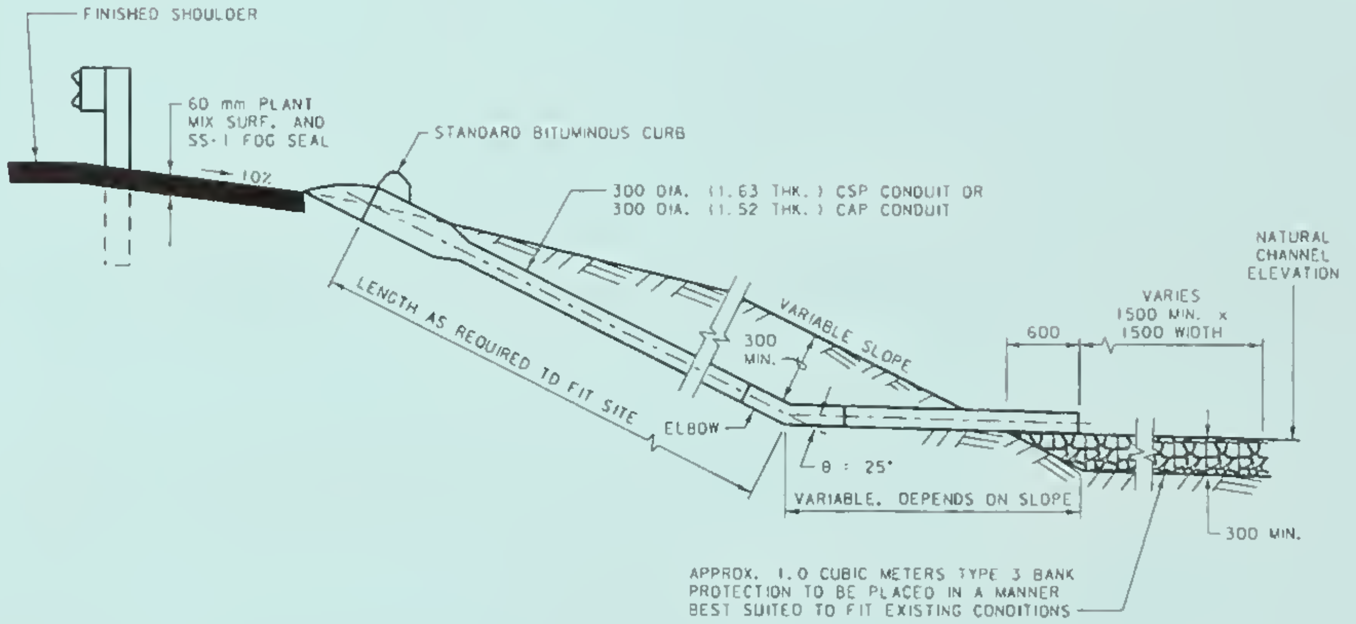
NOTE: DASHED ARROWS DENOTE DIRECTION OF WATER FLOW.



FINISHED SHOULDER
1525 R
610
SLOPE FROM EDGE OF PAVEMENT AT 10%
RAIL FACE
A
1.905 m
1525 R
PL. MIX. BIT. SURF. TO BE PLACED AND WARPED TO FIT GUTTER AND INLET GRADES *
STD. BIT. CURB *
1200
12.70 DIA. GALV. ROD WITH 2 GALV. HEX NUTS EACH END
WARP CURB TO FIT
1680
9140 MINIMUM
1200
450 CMP
450 x 300 REDUCER
300 CMP
A

PLAN VIEW OF INLET



FINISHED SHOULDER
60 mm PLANT MIX SURF. AND SS-1 FOG SEAL
10%
STANDARD BITUMINOUS CURB
300 DIA. (1.63 THK.) CSP CONDUIT OR
300 DIA. (1.52 THK.) CAP CONDUIT
NATURAL CHANNEL ELEVATION
VARIES 1500 MIN. x 1500 WIDTH
600
VARIABLE SLOPE
300 MIN.
LENGTH AS REQUIRED TO FIT SITE
ELBOW
θ : 25°
VARIABLE, DEPENDS ON SLOPE
300 MIN.
APPROX. 1.0 CUBIC METERS TYPE 3 BANK PROTECTION TO BE PLACED IN A MANNER BEST SUITED TO FIT EXISTING CONDITIONS

OUTLET DETAIL

SECTION A-A

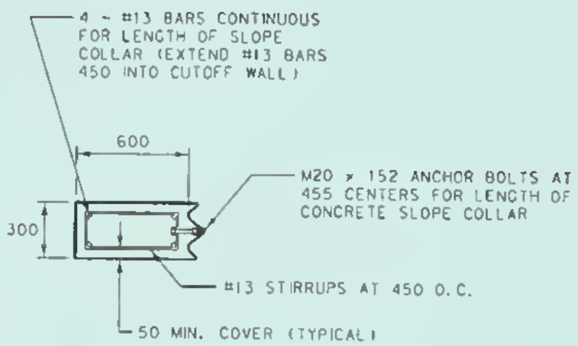
NOTES:

CORRUGATION MAY BE EITHER ANNULAR OR HELICAL. BEND ON ELBOW (θ) IS AS SHOWN UNLESS OTHERWISE SPECIFIED IN THE PLANS OR BY THE ENGINEER.

* INCLUDED WITH ROADWAY QUANTITIES.

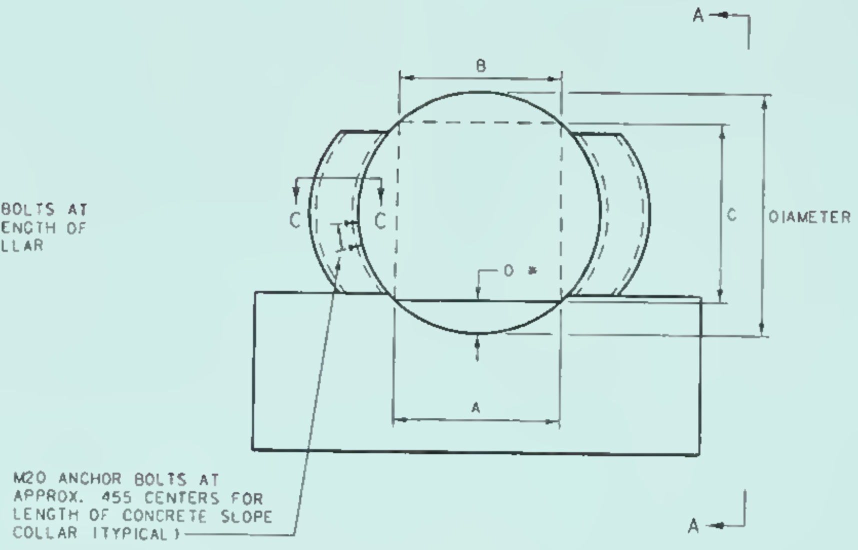
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 603	DWG. NO. 603-28
EMBANKMENT PROTECTOR	
EFFECTIVE: AUGUST 1999	
MDT MONTANA DEPARTMENT OF TRANSPORTATION	MONTANA CADD

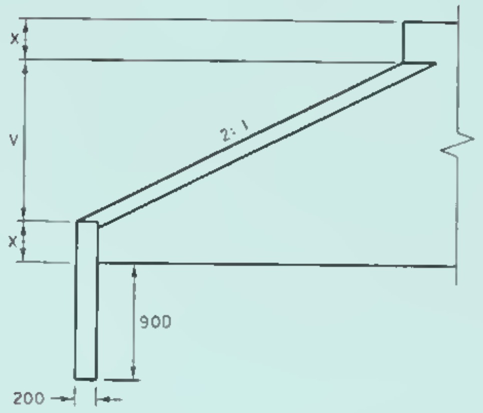

4 ~ #13 BARS CONTINUOUS FOR LENGTH OF SLOPE COLLAR (EXTEND #13 BARS 450 INTO CUTOFF WALL)
600
300
M20 × 152 ANCHOR BOLTS AT 455 CENTERS FOR LENGTH OF CONCRETE SLOPE COLLAR
#13 STIRRUPS AT 450 O.C.
50 MIN. COVER (TYPICAL)

NOTE:
SEE DTL. DWG. NO. 552-00
FOR ANCHOR BOLT DETAILS.

SECTION C-C


A
B
C
C
C
DIAMETER
D *
A
A
M20 ANCHOR BOLTS AT APPROX. 455 CENTERS FOR LENGTH OF CONCRETE SLOPE COLLAR (TYPICAL)

ELEVATION



SECTION A-A

NOTES:

DESIGNATE THESE STRUCTURES, IN PLANS AND PROPOSAL, AS "VEHICULAR UNDERPASS." CONFORM MATERIALS, INSTALLATION, AND OTHER PROVISIONS TO THE STANDARD SPECIFICATIONS. USE THE TERM "VEHICULAR UNDERPASS," REGARDLESS OF THE USE OR PURPOSE OF THE STRUCTURE.

PROVIDE END TREATMENT FOR ALL VEHICULAR UNDERPASSES INCLUDING CUTOFF WALLS, BACKFILL RETAINING WALLS AND CONCRETE SLOPE COLLARS.

PROVIDE SURFACING FOR THE INSIDE OF THE STRUCTURE, CROSS-SLOPED TO ALLOW A DRAINAGE COURSE ALONG ONE SIDE.

FOR PLATE THICKNESS SEE ROAD DESIGN MANUAL FILL HEIGHT TABLES.

USE CLASS "DD" CONCRETE OR EQUAL.

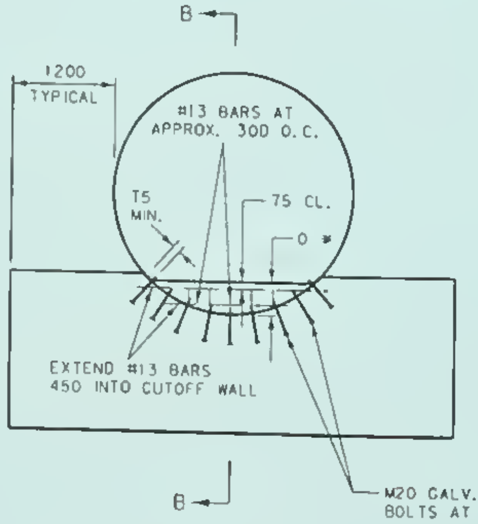
SEE DTL. DWG. NO. 552-08 FOR QUANTITIES.

DEPTH OF SURFACING *		
MATERIAL	ALTERNATE "A"	ALTERNATE "B"
PL. MIX SURF.	—	60
CR. TOP SURF.	60	60
CR. BASE OR SELECT SURF.	BAL.	BAL.

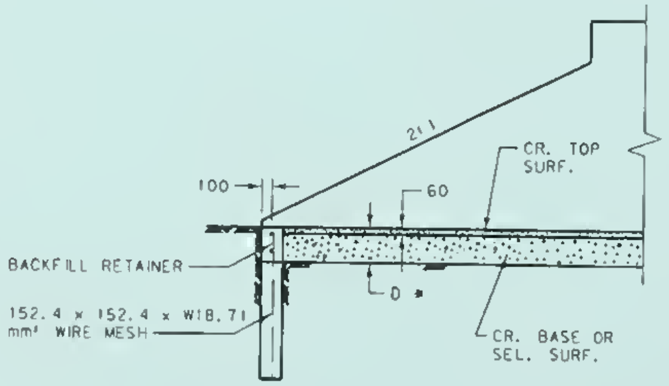
DIAMETER	A (m)	B (m)	C (m)	V (m)	X (m)	* D	BACKFILL RETAINER (m^3)	CONCRETE COLLAR (m^3)
2400	1.2	1.2	2.078	1.200	0.600	173	0.03	0.50
3000	2.1	2.1	2.142	1.500	0.750	441	0.13	0.63
3.825 m	3.0	2.4	2.683	1.916	0.957	750	0.32	0.80
4.135 m	3.0	2.4	3.114	2.071	1.035	669	0.28	0.87
4.755 m	3.6	3.0	3.407	2.381	1.190	848	0.43	1.00
4.910 m	3.6	3.0	3.622	2.459	1.229	809	0.41	1.03
5.220 m	3.6	3.0	4.035	2.613	1.307	744	0.38	1.10
5.530 m	3.6	3.0	4.431	2.770	1.384	690	0.35	1.16
5.840 m	4.8	3.6	3.975	2.924	1.462	1279	0.87	1.23
6.150 m	4.8	3.6	4.428	3.079	1.540	1176	0.80	1.29

	SURFACING QUANTITIES PER METER FOR DEPTH "D" *								
	ALTERNATE "A"		ALTERNATE "B"						
	m^3 SURFACING		TONS SURFACING		m^3 SURFACING		TONS BIT. MATL.		
DIAMETER	CRUSHED TOP SURF.	CR. BASE OR SEL. SURF.	COVER MATERIAL	PLANT MIX	CRUSHED TOP SURF.	CR. BASE OR SEL. SURF.	PLANT MIX	PRIME	SEAL
2400	0.069	0.078	0.0175	0.158	0.053	0.025	0.0095	0.0015	0.0020
3000	0.124	0.525	0.0299	0.284	0.116	0.409	0.0170	0.0029	0.0034
3.825 m	0.181	1.423	0.0429	0.414	0.175	1.248	0.0248	0.0042	0.0049
4.135 m	0.181	1.239	0.0430	0.414	0.174	1.065	0.0248	0.0042	0.0049
4.755 m	0.217	1.942	0.0513	0.496	0.210	1.732	0.0298	0.0051	0.0059
4.910 m	0.217	1.839	0.0514	0.496	0.210	1.629	0.0298	0.0051	0.0059
5.220 m	0.217	1.665	0.0514	0.496	0.209	1.456	0.0298	0.0051	0.0059
5.530 m	0.217	1.524	0.0515	0.496	0.208	1.316	0.0298	0.0050	0.0059
5.840 m	0.289	4.079	0.0681	0.661	0.284	3.795	0.0397	0.0068	0.0078
6.150 m	0.289	3.696	0.0681	0.661	0.283	3.413	0.0397	0.0068	0.0078

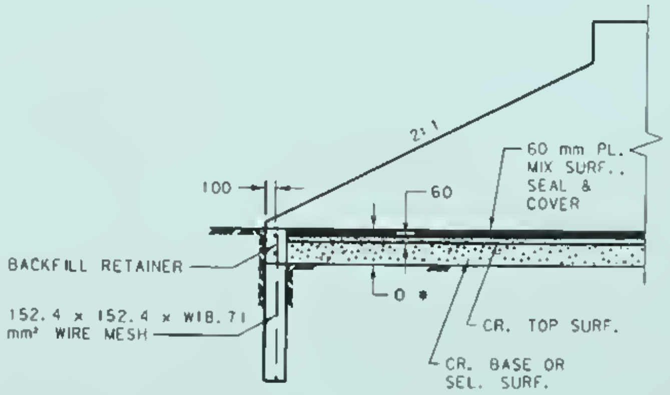
BACKFILL RETAINER & CUTOFF WALL DETAIL


B
1200 TYPICAL
#13 BARS AT APPROX. 300 O.C.
75 MIN.
75 CL.
D *
EXTEND #13 BARS 450 INTO CUTOFF WALL
B
M20 GALV. ANCHOR BOLTS AT 455 O.C.

ELEVATION



SECTION B-B
(ALTERNATE "A")


2:1
60 mm PL. MIX SURF., SEAL & COVER
100
60
BACKFILL RETAINER
152.4 × 152.4 × W18.71 mm^2 WIRE MESH
D *
CR. TOP SURF.
CR. BASE OR SEL. SURF.

SECTION B-B
(ALTERNATE "B")

NOTE:
INCLUDE CONCRETE COLLAR
WHEN SPECIFIED.

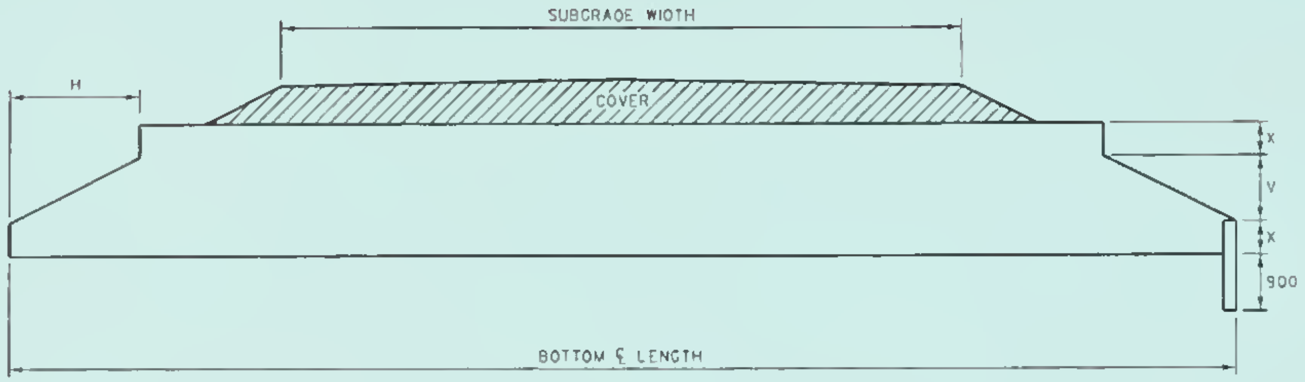
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 552, 603
DWG. NO.
603-30

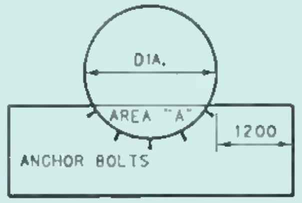
VEHICULAR UNDERPASS AND
BACKFILL RETAINER
& CUTOFF WALL DETAIL

EFFECTIVE: AUGUST 1999

MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



NOTE:
FOR DETAILS COVERING CUTOFF WALLS
SEE DTL. DWG. NO. 552-00.



DIA.	X (m)	V (m)	H (m) FOR BEVELS:		AREA "A" (m²) *
			1.5:1	2:1	
CSP 75 × 25 OR 125 × 25 CORRUGATIONS					
1200	0.300	0.600	0.900	1.200	0.24
1350	0.338	0.674	1.011	1.348	0.30
1500	0.375	0.750	1.125	1.500	0.37
1650	0.412	0.826	1.239	1.652	0.44
1800	0.450	0.900	1.350	1.800	0.52
1950	0.488	0.974	1.461	1.948	0.61
2100	0.525	1.050	1.575	2.100	0.70
2250	0.563	1.124	1.686	2.248	0.81
2400	0.600	1.200	1.800	2.400	0.92
2550	0.637	1.276	1.914	2.552	1.03
2700	0.675	1.350	2.025	2.700	1.15
2850	0.712	1.426	2.139	2.852	1.28
3000	0.750	1.500	2.250	3.000	1.42

DIA.	X (m)	V (m)	H (m) FOR BEVELS:		AREA "A" (m²) *
			1.5:1	2:1	
SSPP 152 × 51 CORRUGATIONS					
3.205	0.802	1.605	2.408	3.210	1.67
3.360	0.841	1.682	2.523	3.364	1.83
3.515	0.880	1.760	2.640	3.520	2.00
3.670	0.919	1.837	2.756	3.674	2.17
3.825	0.957	1.916	2.874	3.832	2.36
3.980	0.996	1.993	2.990	3.986	2.55
4.135	1.035	2.071	3.107	4.142	2.74
4.290	1.074	2.148	3.222	4.296	2.95
4.445	1.113	2.225	3.338	4.450	3.16
4.600	1.152	2.302	3.453	4.604	3.38
4.755	1.190	2.381	3.572	4.762	3.61
4.910	1.229	2.459	3.689	4.918	3.84
5.065	1.268	2.536	3.804	5.072	4.09
5.220	1.307	2.613	3.920	5.226	4.34
5.375	1.346	2.690	4.035	5.380	4.59
5.530	1.384	2.770	4.155	5.540	4.86
5.685	1.423	2.847	4.271	5.694	5.13
5.840	1.462	2.924	4.386	5.848	5.41
5.995	1.501	3.001	4.502	6.002	5.69
6.150	1.540	3.079	4.619	6.158	5.99
6.305	1.578	3.158	4.737	6.316	6.29
6.460	1.617	3.235	4.853	6.470	6.60

* AREA "A" IS TO THE MIDDLE OF THE CORRUGATIONS.

NOMINAL DIAMETER

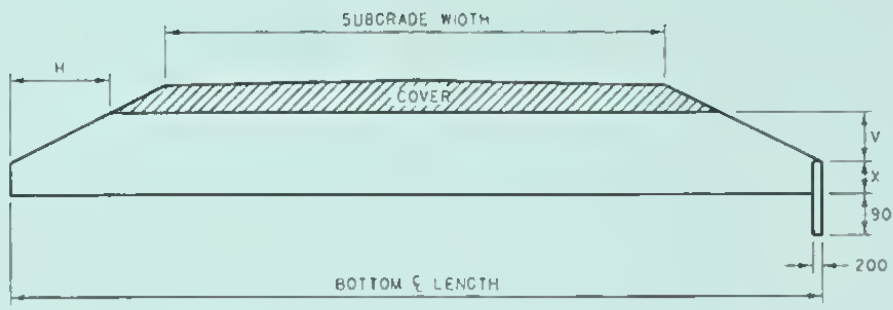
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

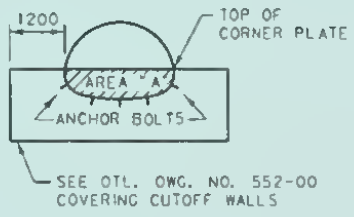
DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 603
DWG. NO.
603-32

STEP BEVEL FOR
CIRCULAR METAL CULVERT

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD





SPAN (m)	RISE (m)	X (m)	V (m)	H (m) FOR BEVELS:			AREA "A" (m²)
				1.5:1	2:1	2.5:1	
SSPPA 152 × 51 CORRUGATIONS WITH 457 CORNER RADIUS							
1.850	1.400	0.533	0.867	1.301	1.734	2.168	0.88
1.930	1.450	0.521	0.929	1.394	1.858	2.323	0.91
2.060	1.500	0.559	0.941	1.412	1.882	2.353	1.01
2.130	1.550	0.544	1.006	1.509	2.012	2.515	1.04
2.210	1.600	0.528	1.072	1.608	2.144	2.680	1.06
2.340	1.650	0.569	1.081	1.622	2.162	2.703	1.18
2.410	1.700	0.551	1.149	1.724	2.298	2.873	1.19
2.490	1.750	0.531	1.219	1.829	2.438	3.048	1.21
2.620	1.800	0.577	1.223	1.835	2.446	3.058	1.34
2.690	1.850	0.556	1.294	1.941	2.588	3.235	1.35
2.840	1.910	0.605	1.305	1.958	2.610	3.263	1.50
2.900	1.960	0.582	1.378	2.067	2.756	3.445	1.50
2.970	2.010	0.556	1.454	2.181	2.908	3.635	1.50
3.120	2.060	0.610	1.450	2.175	2.900	3.625	1.66
3.250	2.110	0.663	1.447	2.171	2.894	3.618	1.85
3.330	2.160	0.638	1.522	2.283	3.044	3.805	1.84
3.480	2.210	0.696	1.514	2.271	3.028	3.785	2.04
3.530	2.260	0.668	1.592	2.388	3.184	3.980	2.03
3.610	2.310	0.640	1.670	2.505	3.340	4.175	2.01
3.760	2.360	0.698	1.662	2.493	3.324	4.155	2.22
3.810	2.410	0.671	1.739	2.609	3.478	4.348	2.20
3.860	2.460	0.640	1.820	2.730	3.640	4.550	2.17
3.910	2.540	0.610	1.930	2.895	3.860	4.825	2.13
4.090	2.570	0.671	1.899	2.849	3.798	4.748	2.37
SSPPA 152 × 51 CORRUGATIONS WITH 787 CORNER RADIUS							
4.040	2.840	1.189	1.651	2.477	3.302	4.128	4.25
4.110	2.900	1.158	1.742	2.613	3.484	4.355	4.21
4.270	2.950	1.219	1.731	2.597	3.462	4.328	4.56
4.320	3.000	1.158	1.842	2.763	3.684	4.605	4.42
4.390	3.050	1.128	1.922	2.883	3.844	4.805	4.40
4.550	3.100	1.219	1.881	2.822	3.762	4.703	4.87
4.670	3.150	1.311	1.839	2.759	3.678	4.598	5.35
4.750	3.200	1.250	1.950	2.925	3.900	4.875	5.20
4.830	3.250	1.189	2.061	3.092	4.122	5.153	5.03
4.950	3.300	1.311	1.989	2.984	3.978	4.973	5.68
5.030	3.350	1.250	2.100	3.150	4.200	5.250	5.52
5.180	3.400	1.341	2.059	3.089	4.118	5.148	6.02
5.230	3.450	1.311	2.139	3.209	4.278	5.348	6.00
5.310	3.510	1.250	2.260	3.390	4.520	5.650	5.82
5.460	3.560	1.311	2.249	3.374	4.498	5.623	6.18
5.510	3.610	1.280	2.330	3.495	4.660	5.825	6.17
5.660	3.660	1.372	2.288	3.432	4.576	5.720	6.71
5.720	3.710	1.311	2.399	3.599	4.798	5.998	6.51
5.870	3.760	1.402	2.358	3.537	4.716	5.895	7.08
5.940	3.810	1.341	2.469	3.704	4.938	6.173	6.88
5.990	3.860	1.311	2.549	3.824	5.098	6.373	6.84
6.070	3.910	1.250	2.660	3.990	5.320	6.650	6.63
6.220	3.960	1.341	2.619	3.929	5.238	6.548	7.21
6.270	4.010	1.311	2.699	4.049	5.398	6.748	7.17

SPAN	RISE	X (m)	V (m)	H (m) FOR BEVELS:			AREA "A" (m²)
				1.5:1	2:1	2.5:1	
CSPA 75 × 25 CORRUGATIONS (SEE NOTE ⊗)							
1010	790	0.330	0.460	0.690	0.920	~	0.29
1160	920	0.395	0.525	0.788	1.050	~	0.40
1340	1050	0.385	0.665	0.998	1.330	~	0.38
1520	1170	0.520	0.650	0.975	1.300	~	0.65
1670	1300	0.580	0.720	1.080	1.440	~	0.80
1850	1400	0.640	0.760	1.140	1.520	~	0.99
2050	1500	0.605	0.895	1.343	1.790	~	1.03
2200	1620	0.655	0.965	1.448	1.930	~	1.22
2400	1720	0.705	1.015	1.523	2.030	~	1.42
2600	1820	0.755	1.065	1.598	2.130	~	1.65
2840	1920	0.805	1.115	1.673	2.230	~	1.88
2970	2020	0.855	1.165	1.748	2.330	~	2.14
3240	2120	0.905	1.215	1.823	2.430	~	2.40
3470	2220	0.955	1.265	1.898	2.530	~	2.69
3600	2320	1.005	1.315	1.973	2.630	~	2.99
CSPA 68 × 13 CORRUGATIONS (SEE NOTE ⊗)							
1440	970	0.330	0.640	0.960	1.280	~	0.41
1620	1100	0.370	0.730	1.095	1.460	~	0.52
1800	1200	0.415	0.785	1.178	1.570	~	0.64
1950	1320	0.455	0.865	1.298	1.730	~	0.76
2100	1450	0.495	0.955	1.433	1.910	~	0.89

NOTES:

BEVEL TO TOP OF CORNER PLATE.

PIPE ENDS ARE SQUARE (PERPENDICULAR TO CENTERLINE OF PIPE) AND FILL SLOPES ARE WARPED TO ACCOMMODATE THE SQUARE ENDS UNLESS SPECIFIED OTHERWISE ON PLANS.

⊗ TABULATED VALUES BASED ON NOMINAL PIPE DIMENSIONS. IN PLACE DIMENSIONS SUBJECT TO TOLERANCES LISTED IN CURRENT AASHTO M 36M AND M 196M.

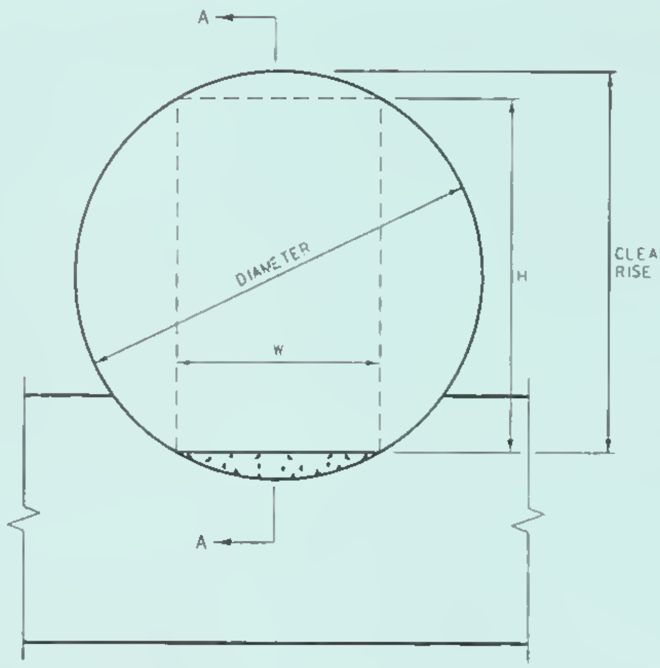
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

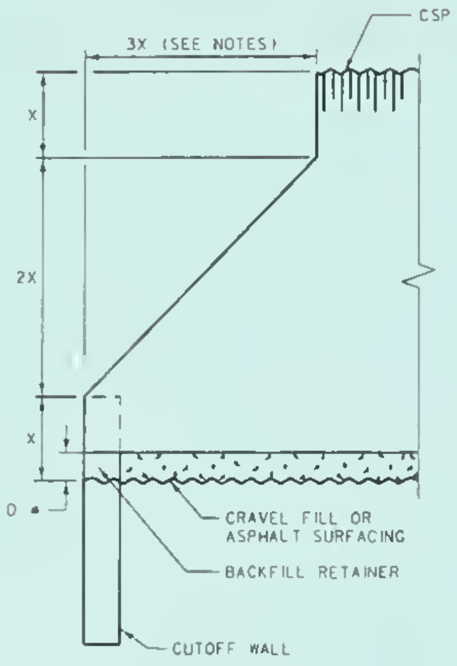
DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 603
DWG. NO.
603-34

BEVEL ON ARCH
METAL CULVERT

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD





SECTION A-A

DIAMETER	X (m)	* D	CLEAR RISE (m)	H (m)	W (m)	BACKFILL RETAINER (m³)
2100	0.525	168	1.944	1.789	1.1	0.03
2250	0.563	257	2.006	1.761	1.4	0.05
2400	0.600	276	2.137	1.873	1.5	0.06

	SURFACING QUANTITIES PER METER FOR DEPTH "D" *				
	FULL DEPTH GRAVEL	60 mm PMS AND REMAINING DEPTH GRAVEL			
	m³ SURF.	TONS SURF.	m³ SURF.	TONS BIT. MATERIAL	
DIAMETER	CR. TOP SURF.	PLANT MIX	CR. TOP SURF.	PLANT MIX	PRIME
2100	0.131	0.144	0.068	0.0086	0.0013
2250	0.253	0.188	0.171	0.0113	0.0018
2400	0.291	0.201	0.203	0.0121	0.0020

NOTES:

UNLESS OTHERWISE SPECIFIED, INSTALL STOCKPASSES WITH CUTOFF WALLS AND BACKFILL RETAINERS AT EACH END. GRAVEL FILL AND BEDDING MATERIAL.

WHEN SPECIFIED, INSTALL COMBINATION STOCKPASSES AND DRAINS WITH CUTOFF WALLS, BACKFILL RETAINERS AT BOTH ENDS, CONCRETE EDGE PROTECTION AT THE INLET END, RANDOM RIPRPAP AT THE OUTLET END, BEDDING MATERIAL AND ASPHALT SURFACING: CROSS SLOPE ASPHALT SURFACING TO ALLOW DRAINAGE COURSE ALONG ONE SIDE. (SEE DTL. DWG. NO. 613-14 AND 613-06.)

UNLESS OTHERWISE SPECIFIED, STEP BEVEL PIPE ENDS AT A 1.5:1 SLOPE.

SEE FILL HEIGHT TABLES FOR THICKNESS REQUIREMENTS.

SEE DTL. DWG. NO. 552-00, 603-30 AND 603-18.

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

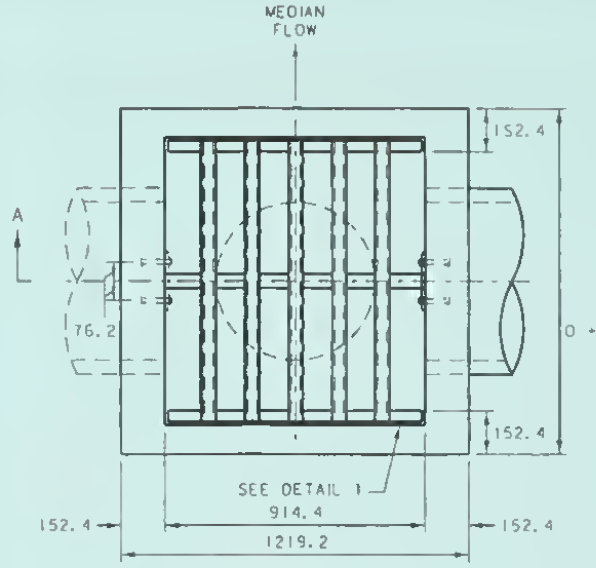
DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 603
DWG. NO.
603-36

CORRUGATED STEEL
PIPE STOCKPASS

EFFECTIVE: AUGUST 1999

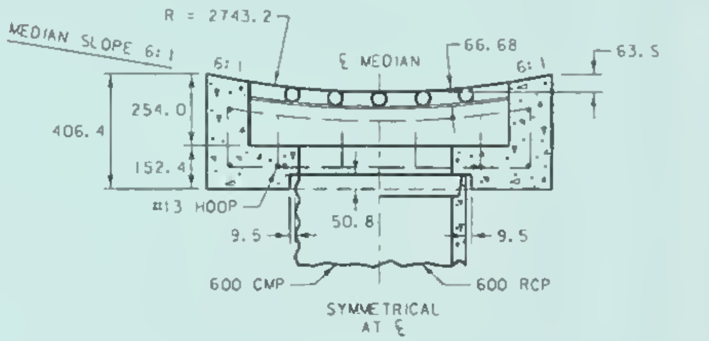
MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

NOTE:
WHEN MEDIAN INLET COVER IS INSTALLED OVER PIPES LARGER THAN 900 mm, WITHOUT ADEQUATE COVER TO PERMIT THE USE OF TYPE 1 INSTALLATION, PROVIDE A DETAIL OF THE INSTALLATION IN THE PLANS.



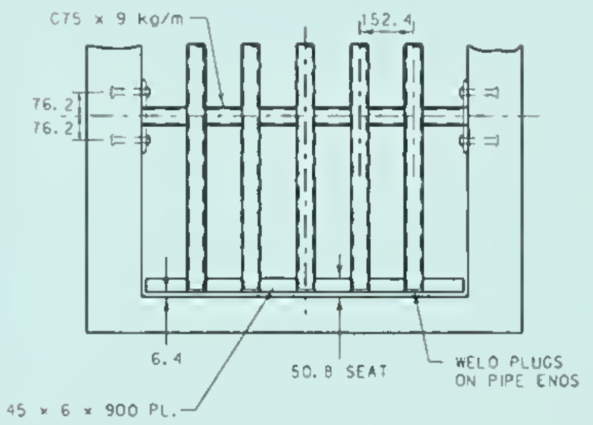
PLAN VIEW

TYPICAL FOR TYPES 1, 2 AND 3

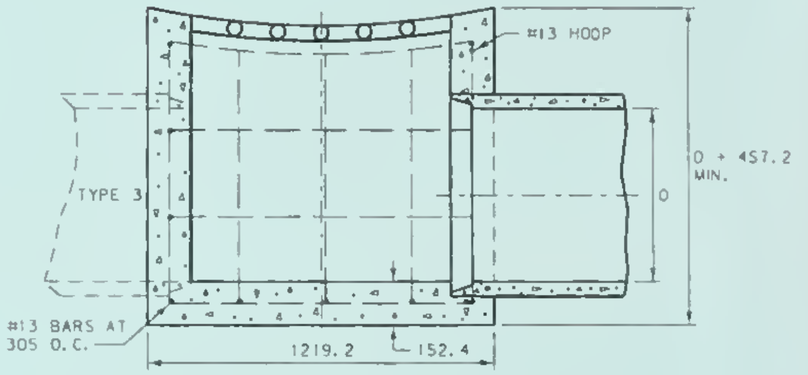


SECTION A-A

TYPE 1

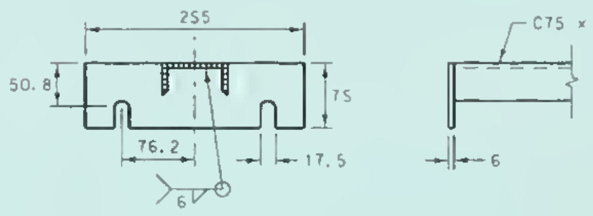


DETAIL 1

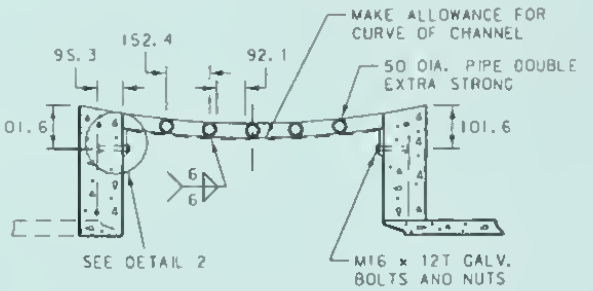


SECTION A-A

TYPE 2 HAS 1 PIPE CONNECTION
TYPE 3 HAS 2 PIPE CONNECTIONS



DETAIL 2


MAKE ALLOWANCE FOR CURVE OF CHANNEL
95.3
152.4
92.1
50 DIA. PIPE DOUBLE EXTRA STRONG
101.6
101.6
6
6
SEE DETAIL 2
M16 x 12T GALV. BOLTS AND NUTS

COVER DETAIL

TYPES 2 & 3

GRATE AND REINFORCING STEEL (kg) *			
TYPE	CMP AND RCP		
	600 mm	750 mm	900 mm
1	22.7	–	–
2	38.6	43.1	47.6
3	38.6⊛	43.1⊛	47.6⊛
GRATE	74.8	83.9	95.3

CLASS "DD" CONC. OR EQUAL (CUBIC METERS) *						
TYPE	600 mm		750 mm		900 mm	
	CMP	RCP	CMP	RCP	CMP	RCP
1	0.31	0.31	–	–	–	–
2	0.76	0.76	0.84	0.76	0.92	0.84
3	0.69⊛	0.69⊛	0.76⊛	0.69⊛	0.76⊛	0.69⊛

* QUANTITIES ARE FOR ESTIMATING PURPOSES ONLY.
⊛ TYPE 3 IS A SPECIAL CASE TO BE FIGURED FOR THE PARTICULAR INSTALLATION.

NOTE:
PAINT ALL EXPOSED METAL PARTS WITH ONE COAT OF ZINC RICH PAINT AND TWO COATS OF ALUMINUM PAINT IN ACCORDANCE WITH SECTION 710 OF THE STANDARD SPECIFICATIONS.

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

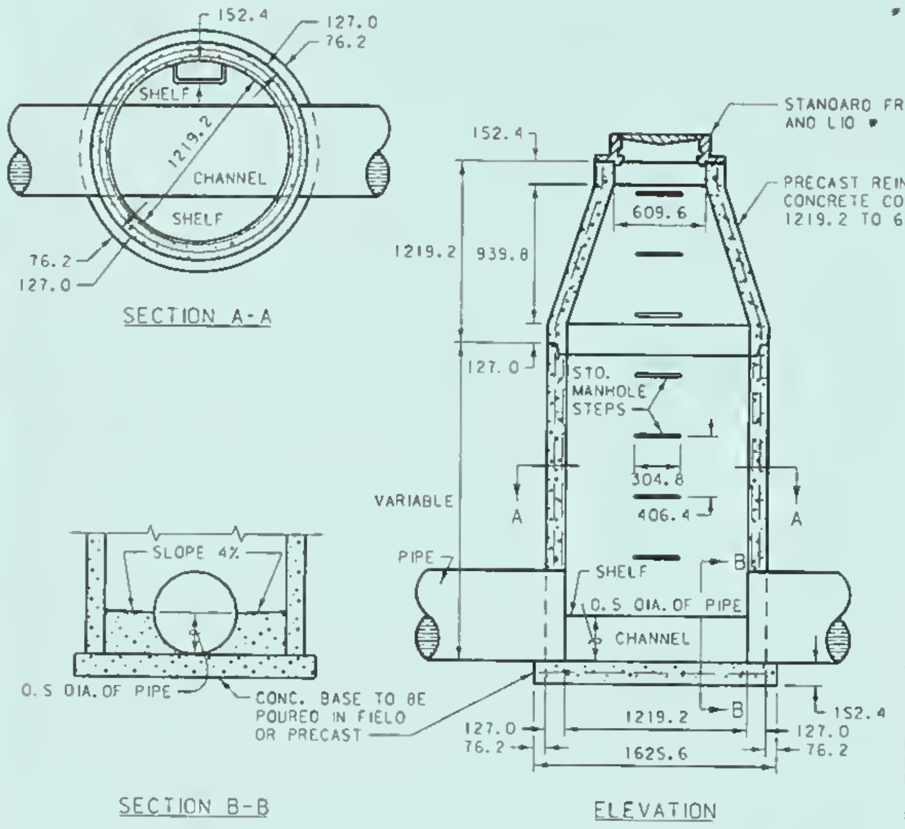
DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 604
DWG. NO.
604-00

MEDIAN INLET COVER

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

* MINIMUM WEIGHT FOR FRAME AND LID IS 180 kg. TOOL RING AND COVER TO A MACHINE FIT.



SECTION A-A

SECTION B-B

ELEVATION

TYPE 1 MANHOLE

UPPER PART IS A CONE TO REDUCE DIAMETER FROM 1219.2 mm TO 609.6 mm. CUT BOTTOM OF LOWER SECTION SQUARE TO FIT BASE. GROUT JOINT BETWEEN BASE AND WALL. A GROUT CONSISTING OF ONE PART PORTLAND CEMENT AND TWO PARTS APPROVED SAND MAY BE USED; AN APPROVED PREMIXED GROUT, AVAILABLE COMMERCIALLY, MAY BE USED.

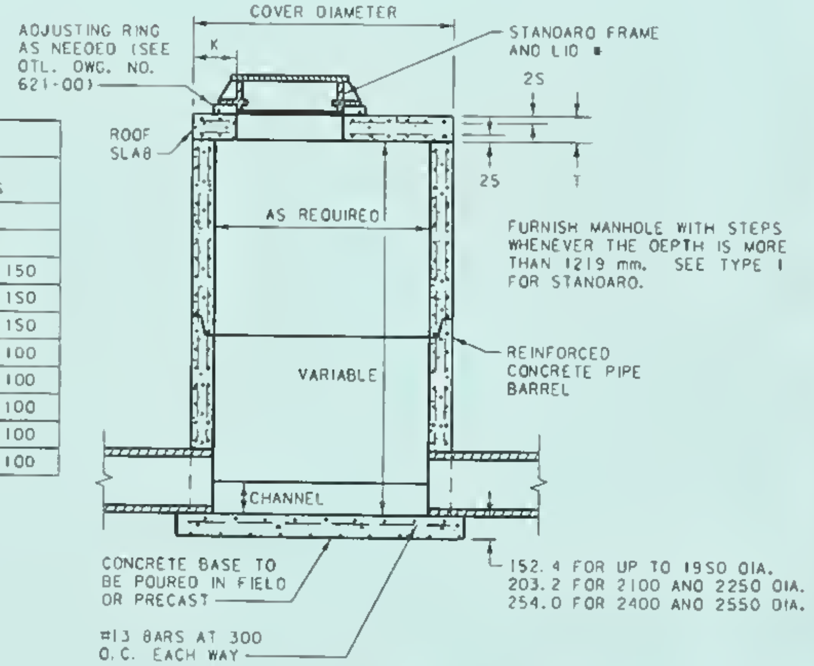
CONFORM ALL MANHOLE CONSTRUCTION, EXCEPTING FRAME, LID, AND BASE, TO AASHTO M 199M. THIS PROVIDES THAT REINFORCEMENT MAY BE MADE OF (1) COLD DRAWN STEEL WIRE- AASHTO M 32M, (2) STEEL WIRE FABRIC- AASHTO M 55M, OR (3) STEEL BARS- AASHTO M 31M.

THE CONSTRUCTION AND REINFORCEMENT OF THE BASE FOR EACH TYPE MUST BE COMPATIBLE WITH THE CONDITIONS AND THE WEIGHT OF THE SUPERSTRUCTURE. AASHTO M 199M PROVIDES FOR 27.6 MPa CONCRETE. THE MIX CALLS FOR 335 kg OF CEMENT PER CUBIC METER. REINFORCEMENT SHOWN IS ILLUSTRATIVE ONLY. SEE AASHTO M 199M.

THE ECCENTRIC CONE TRANSITION WILL BE PERMITTED WHEN ITS USE WILL BE AS GOOD OR BETTER THAN THE ONES SHOWN, OR IF IT IS MORE ADAPTABLE TO EXISTING CONDITIONS.

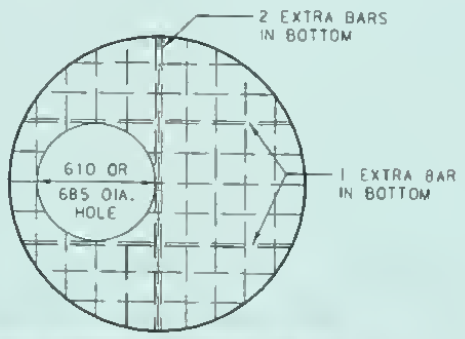
USE MANHOLE STEPS THAT ARE METALLIC AND COATED WITH COPOLYMER POLYPROPYLENE, OR AN APPROVED EQUAL. THE MINIMUM DESIGN LIVE LOAD FOR A SINGLE CONCENTRATED LOAD IS 135 kg.

TYPE 3 MANHOLE ROOF SLAB					
PIPE DIA.	SLAB DIA.	T	K	BOTTOM BARS	TOP BARS
1200	1473.2	152.4	152.4	#13 AT 150	~
1350	1651.0	203.2	152.4	#13 AT 150	~
1500	1828.8	203.2	177.8	#13 AT 150	#10 AT 150
1650	2006.6	203.2	177.8	#13 AT 150	#10 AT 150
1800	2184.4	203.2	203.2	#13 AT 150	#10 AT 150
1950	2362.2	203.2	203.2	#13 AT 100	#13 AT 100
2100	2540.0	203.2	228.6	#13 AT 100	#13 AT 100
2250	2717.8	203.2	228.6	#13 AT 100	#13 AT 100
2400	2895.6	203.2	228.6	#16 AT 100	#13 AT 100
2550	3073.4	203.2	228.6	#16 AT 100	#13 AT 100


COVER DIAMETER
ADJUSTING RING AS NEEDED (SEE DTL. DWG. NO. 621-00)
K
STANDARD FRAME AND LID *
25
ROOF SLAB
25
T
AS REQUIRED
VARIABLE
REINFORCED CONCRETE PIPE BARREL
CHANNEL
CONCRETE BASE TO BE POURED IN FIELD OR PRECAST
#13 BARS AT 300 O.C. EACH WAY
152.4 FOR UP TO 1950 DIA.
203.2 FOR 2100 AND 2250 DIA.
254.0 FOR 2400 AND 2550 DIA.

FURNISH MANHOLE WITH STEPS WHENEVER THE DEPTH IS MORE THAN 1219 mm. SEE TYPE 1 FOR STANDARD.

TYPE 3 MANHOLE



TYPE 3 MANHOLE ROOF SLAB

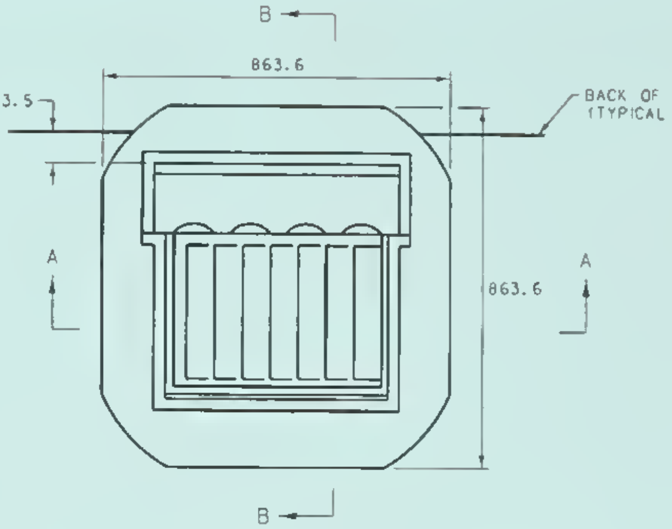
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 604, 711
DWG. NO.
604-02

CONCRETE MANHOLE

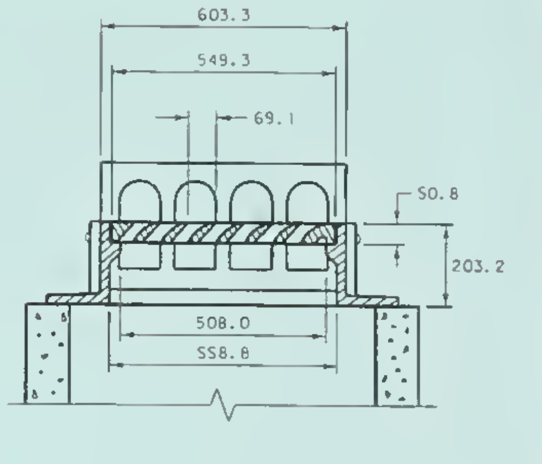
EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

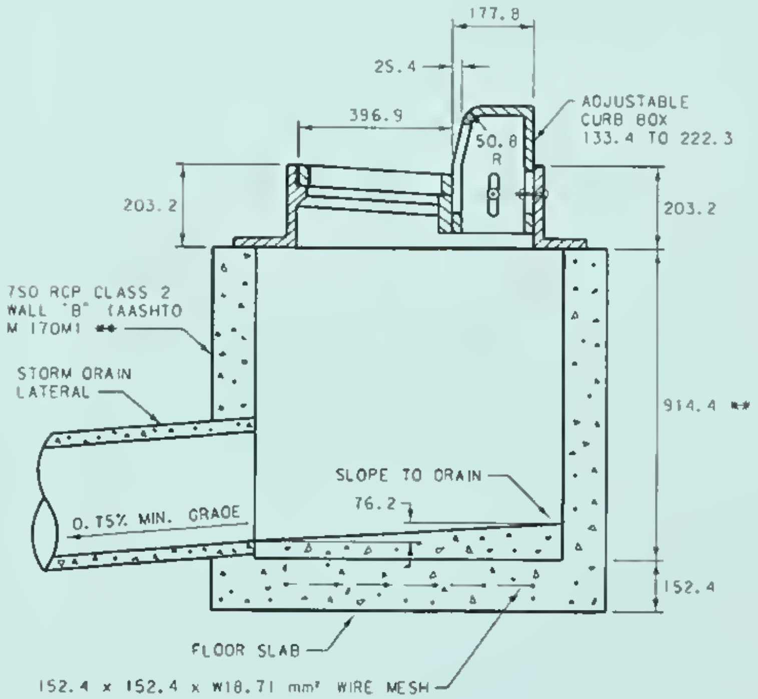


PLAN

NEENAH FOUNDRY R-3286-8V (JUNE 1992 REVISION) OR APPROVED EQUAL (VANE STYLE)



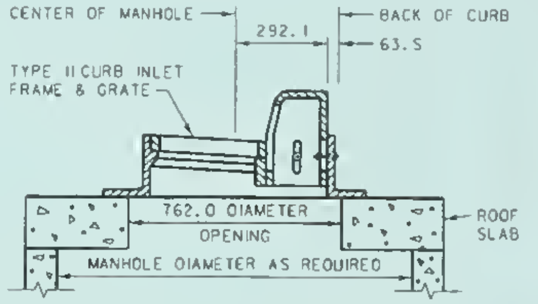
SECTION A-A

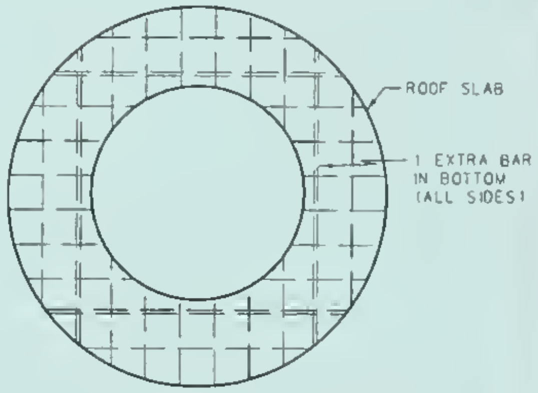

177.8
25.4
396.9
50.8 R
ADJUSTABLE CURB BOX 133.4 TO 222.3
203.2
203.2
750 RCP CLASS 2 WALL "B" (AASHTO M 170M) **
STORM DRAIN LATERAL
914.4 **
SLOPE TO DRAIN
76.2
0.75% MIN. GRADE
152.4
FLOOR SLAB
152.4 x 152.4 x W18.71 mm² WIRE MESH

SECTION B-B

** STANDARD UNLESS OTHERWISE NOTED ON THE PLANS.

COMBINATION





ROOF SLAB

SEE DETAILED DRAWING NO. 604-02 FOR DIAMETER, SLAB THICKNESS AND REINFORCING REQUIREMENTS FOR COMBINATION TYPE 3 MANHOLE, TYPE II CURB INLET.

NOTE:
ALL CONCRETE IS CLASS "DD" OR APPROVED EQUAL.

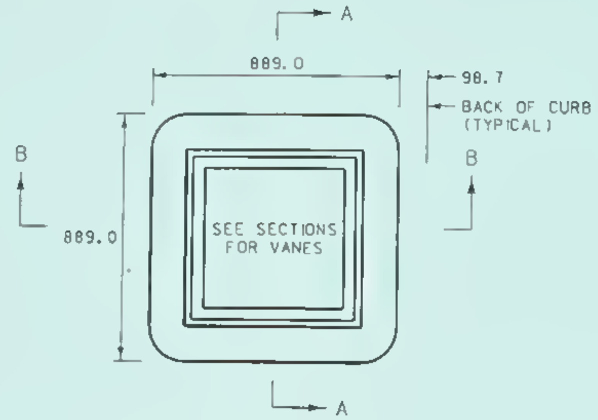
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 604
DWG. NO.
604-03

CURB INLET
TYPE II

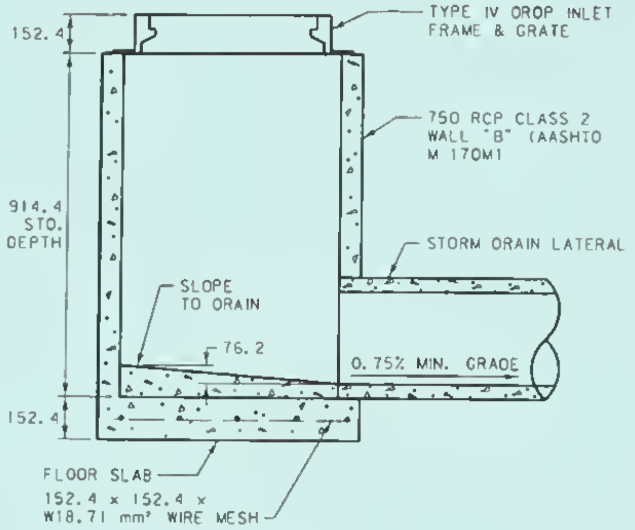
EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

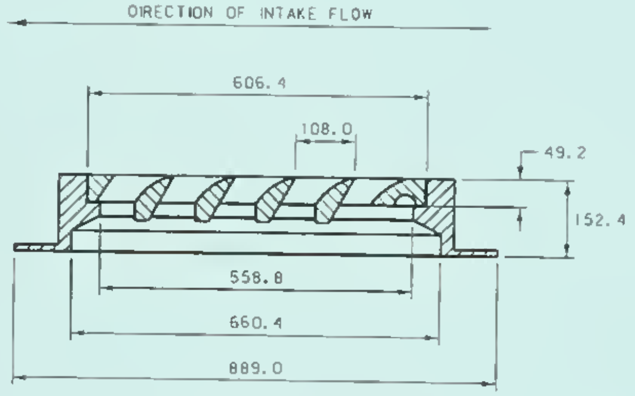


PLAN

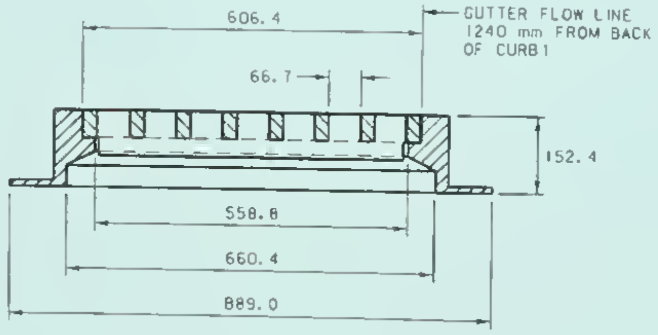
NEENAH CASTING R-3210-L (VANE STYLE) OR APPROVED EQUAL


152.4
TYPE IV DROP INLET FRAME & GRATE
750 RCP CLASS 2 WALL "B" (AASHTO M 170M)
914.4 STD. DEPTH
STORM DRAIN LATERAL
SLOPE TO DRAIN
76.2
0.75% MIN. GRADE
152.4
FLOOR SLAB
152.4 x 152.4 x W18.71 mm² WIRE MESH

SINGLE DROP INLET
TYPE IV

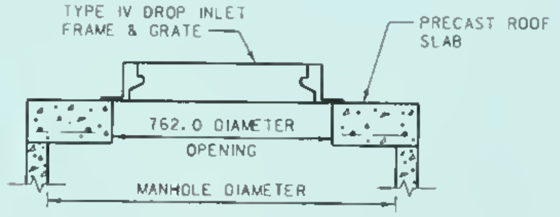


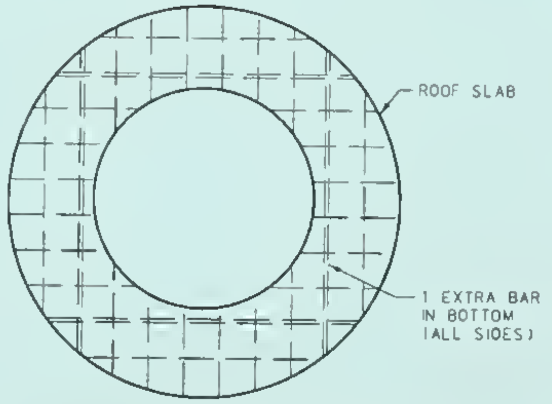
SECTION A-A



SECTION B-B

COMBINATION





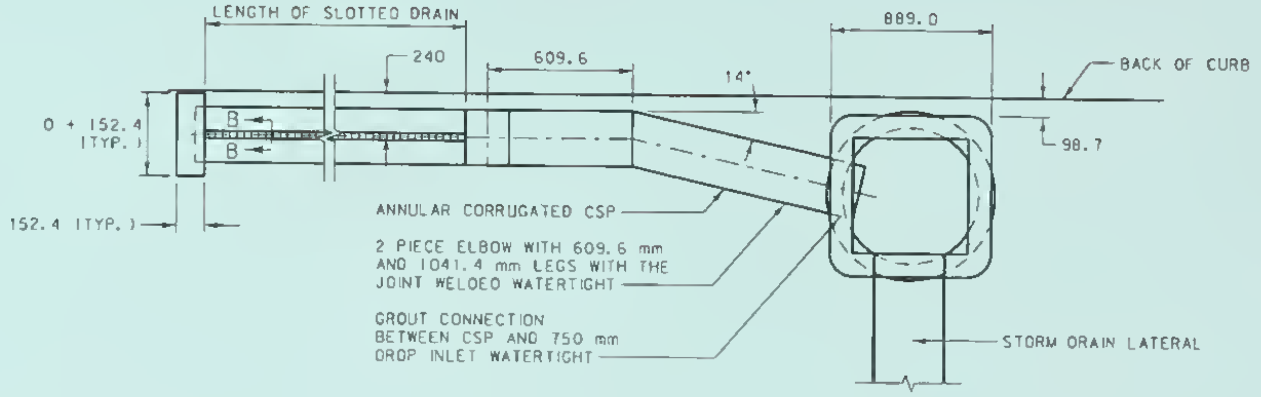
ROOF SLAB

SEE DETAILED DRAWING NO. 604-02 FOR DIAMETER, SLAB THICKNESS AND REINFORCING REQUIREMENTS FOR COMBINATION TYPE 3 MANHOLE, TYPE IV DROP INLET.

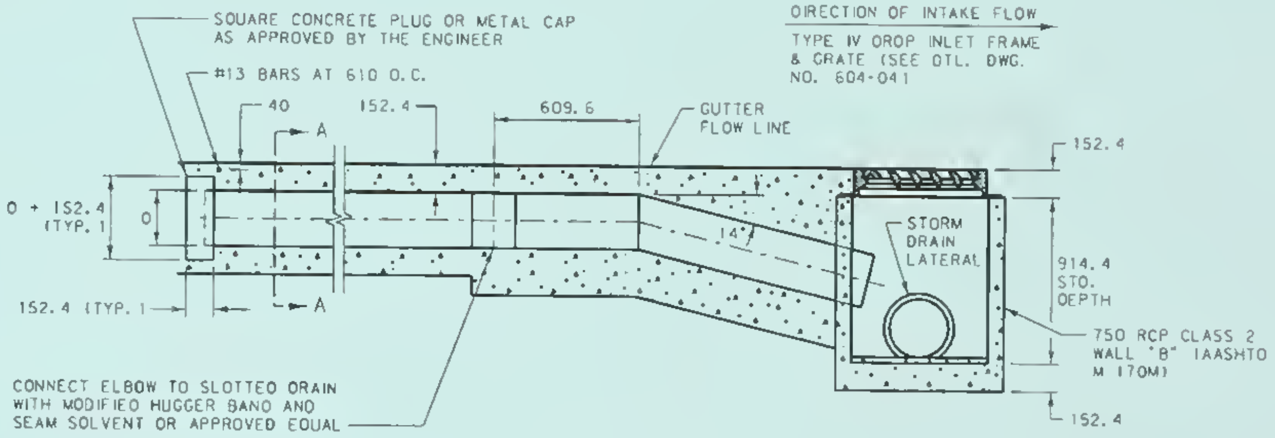
NOTE:
ALL CONCRETE IS CLASS "DD" OR APPROVED EQUAL.

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

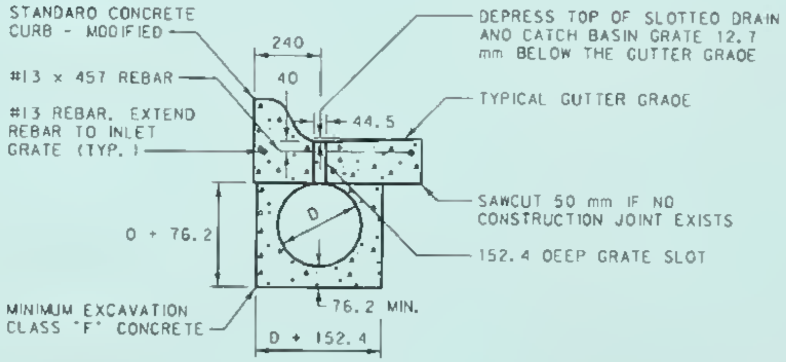
DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 604
DWG. NO.
604-04
DROP INLET
TYPE IV
EFFECTIVE: AUGUST 1999
MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD


LENGTH OF SLOTTED DRAIN
240
609.6
14°
889.0
BACK OF CURB
D + 152.4 (TYP.)
B
B
98.7
152.4 (TYP.)
ANNULAR CORRUGATED CSP
2 PIECE ELBOW WITH 609.6 mm AND 1041.4 mm LEGS WITH THE JOINT WELDED WATERTIGHT
GROUT CONNECTION BETWEEN CSP AND 750 mm DROP INLET WATERTIGHT
STORM DRAIN LATERAL

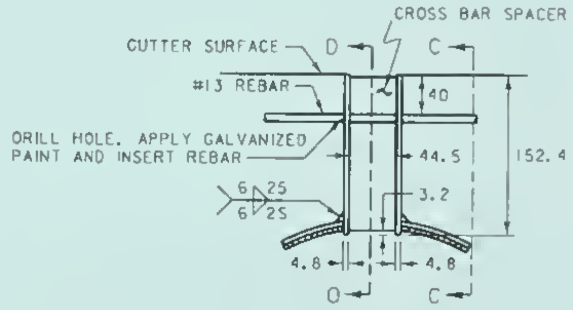
PLAN


SQUARE CONCRETE PLUG OR METAL CAP AS APPROVED BY THE ENGINEER
#13 BARS AT 610 O.C.
40
A
152.4
609.6
GUTTER FLOW LINE
DIRECTION OF INTAKE FLOW
TYPE IV DROP INLET FRAME & GRATE (SEE DTL. DWG. NO. 604-04)
152.4
D + 152.4 (TYP.)
D
14°
STORM DRAIN LATERAL
914.4 STD. DEPTH
152.4 (TYP.)
A
750 RCP CLASS 2 WALL "B" (AASHTO M 170M)
CONNECT ELBOW TO SLOTTED DRAIN WITH MODIFIED HUGGER BAND AND SEAM SOLVENT OR APPROVED EQUAL
152.4

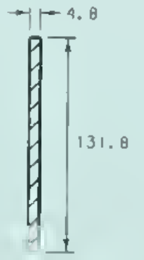
ELEVATION


STANDARD CONCRETE CURB - MODIFIED
240
40
#13 x 457 REBAR
#13 REBAR, EXTEND REBAR TO INLET GRATE (TYP.)
DEPRESS TOP OF SLOTTED DRAIN AND CATCH BASIN GRATE 12.7 mm BELOW THE GUTTER GRADE
44.5
TYPICAL GUTTER GRADE
D
D + 76.2
SAWCUT 50 mm IF NO CONSTRUCTION JOINT EXISTS
152.4 DEEP GRATE SLOT
MINIMUM EXCAVATION CLASS "F" CONCRETE
76.2 MIN.
D + 152.4

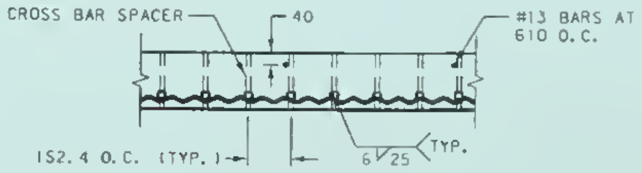
SECTION A-A



SECTION B-B
GRATE SLOT DETAIL



SECTION D-D
CROSS BAR SPACER



SECTION C-C
GRATE SLOT WELDING DETAIL

NOTE:
PAINT ALL WELDS AND OTHER NON-GALVANIZED PARTS, EXCEPT REBAR IN ACCORDANCE WITH STD. SPEC. SECTION 710.

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 604
DWG. NO.
604-06
TYPE IV
DROP INLET WITH
SLOTTED DRAIN
EFFECTIVE: AUGUST 1999
MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

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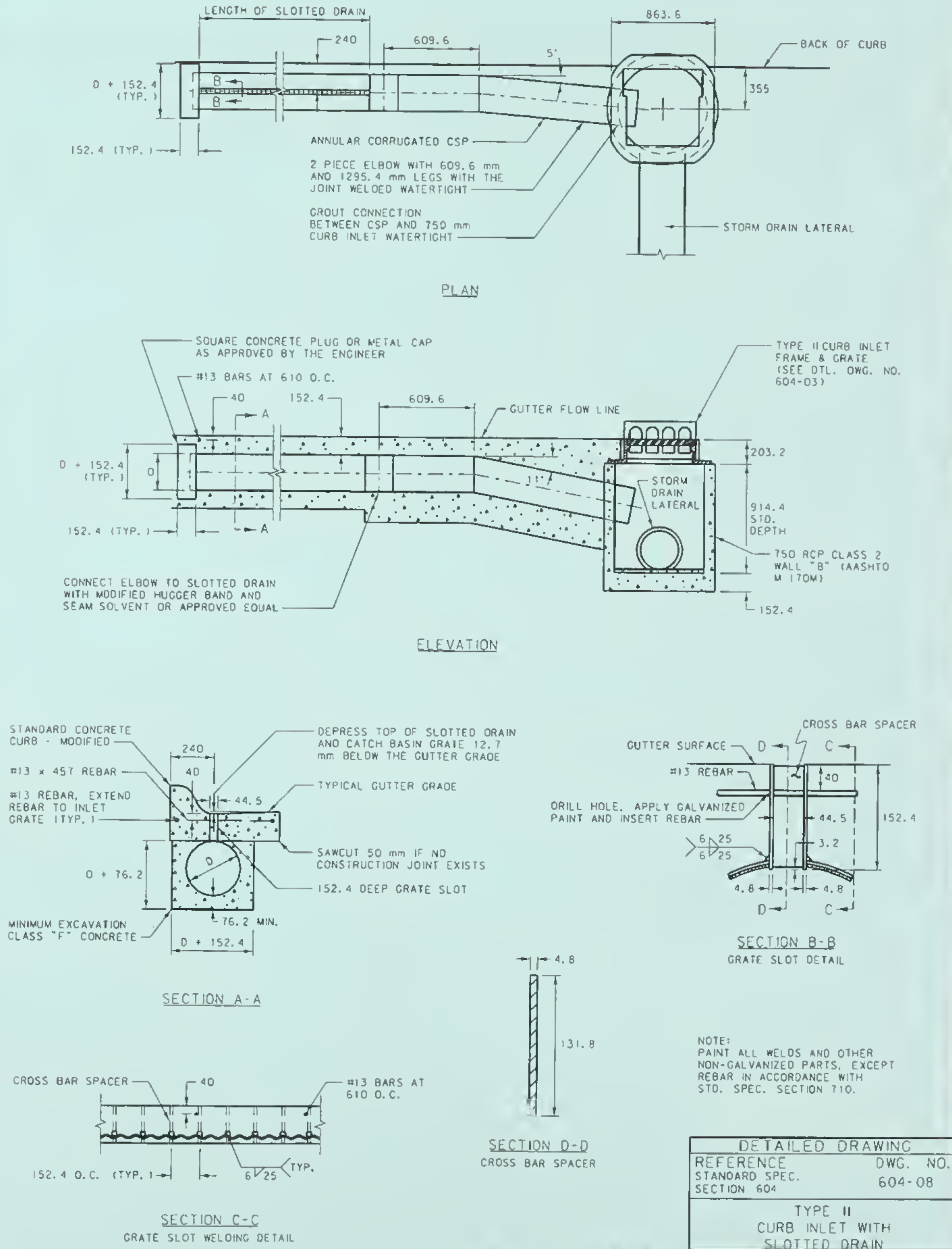

LENGTH OF SLOTTED DRAIN
240
609.6
863.6
5°
BACK OF CURB
D + 152.4 (TYP.)
B
B
355
152.4 (TYP.)
ANNULAR CORRUGATED CSP
2 PIECE ELBOW WITH 609.6 mm AND 1295.4 mm LEGS WITH THE JOINT WELDED WATERTIGHT
GROUT CONNECTION BETWEEN CSP AND 750 mm CURB INLET WATERTIGHT
STORM DRAIN LATERAL
PLAN
SQUARE CONCRETE PLUG OR METAL CAP AS APPROVED BY THE ENGINEER
#13 BARS AT 610 O.C.
40
A
152.4
609.6
GUTTER FLOW LINE
TYPE II CURB INLET FRAME & GRATE (SEE DTL. DWG. NO. 604-03)
D + 152.4 (TYP.)
D
11°
STORM DRAIN LATERAL
203.2
914.4 STD. DEPTH
152.4 (TYP.)
A
750 RCP CLASS 2 WALL "B" (AASHTO M 170M)
152.4
CONNECT ELBOW TO SLOTTED DRAIN WITH MODIFIED HUGGER BAND AND SEAM SOLVENT OR APPROVED EQUAL
ELEVATION
STANDARD CONCRETE CURB - MODIFIED
240
40
#13 x 457 REBAR
#13 REBAR, EXTEND REBAR TO INLET GRATE (TYP.)
44.5
DEPRESS TOP OF SLOTTED DRAIN AND CATCH BASIN GRATE 12.7 mm BELOW THE GUTTER GRADE
TYPICAL GUTTER GRADE
D
D + 76.2
SAWCUT 50 mm IF NO CONSTRUCTION JOINT EXISTS
152.4 DEEP GRATE SLOT
76.2 MIN.
MINIMUM EXCAVATION CLASS "F" CONCRETE
D + 152.4
SECTION A-A
CROSS BAR SPACER
GUTTER SURFACE
D
C
#13 REBAR
40
DRILL HOLE, APPLY GALVANIZED PAINT AND INSERT REBAR
44.5
152.4
6 25
6 25
3.2
4.8
4.8
D
C
SECTION B-B
GRATE SLOT DETAIL
4.8
131.8
SECTION D-D
CROSS BAR SPACER
CROSS BAR SPACER
40
#13 BARS AT 610 O.C.
152.4 O.C. (TYP.)
6 25
TYP.
SECTION C-C
GRATE SLOT WELDING DETAIL

NOTE:
PAINT ALL WELDS AND OTHER NON-GALVANIZED PARTS, EXCEPT REBAR IN ACCORDANCE WITH STD. SPEC. SECTION 710.

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

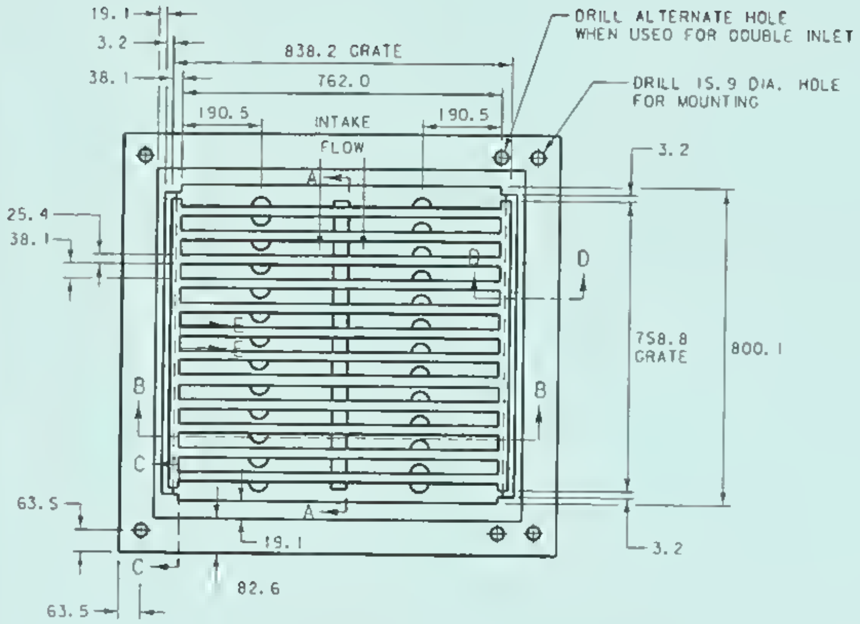
DETAILED DRAWING

REFERENCE	DWG. NO.
STANDARD SPEC. SECTION 604	604-08

TYPE II
CURB INLET WITH
SLOTTED DRAIN

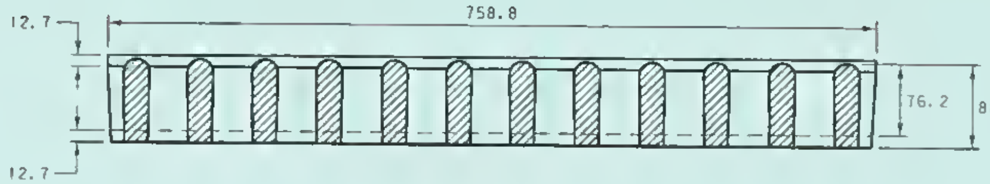
EFFECTIVE: AUGUST 1999

MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

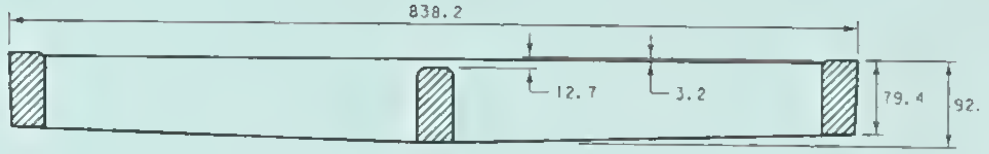


PLAN

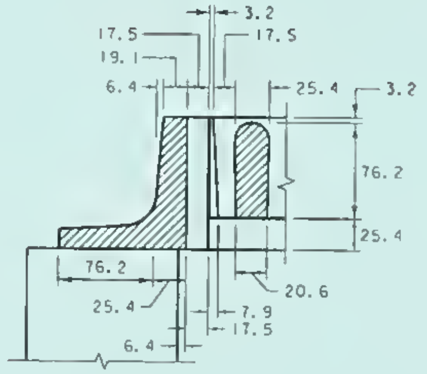
NOTE: INSTALL GRATE WITH BARS PERPENDICULAR TO INTAKE FLOW



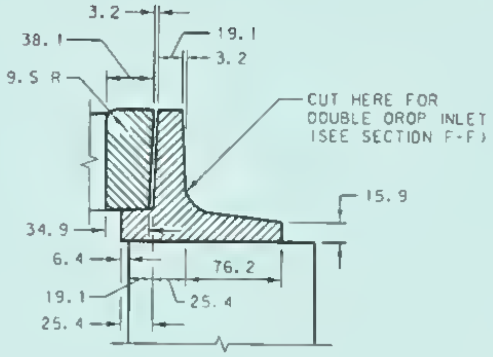
SECTION A-A
GRATE



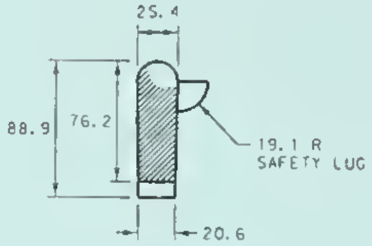
SECTION B-B
GRATE



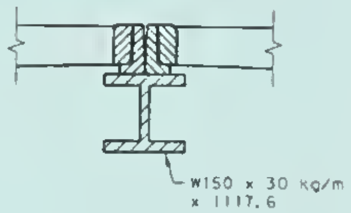
SECTION C-C



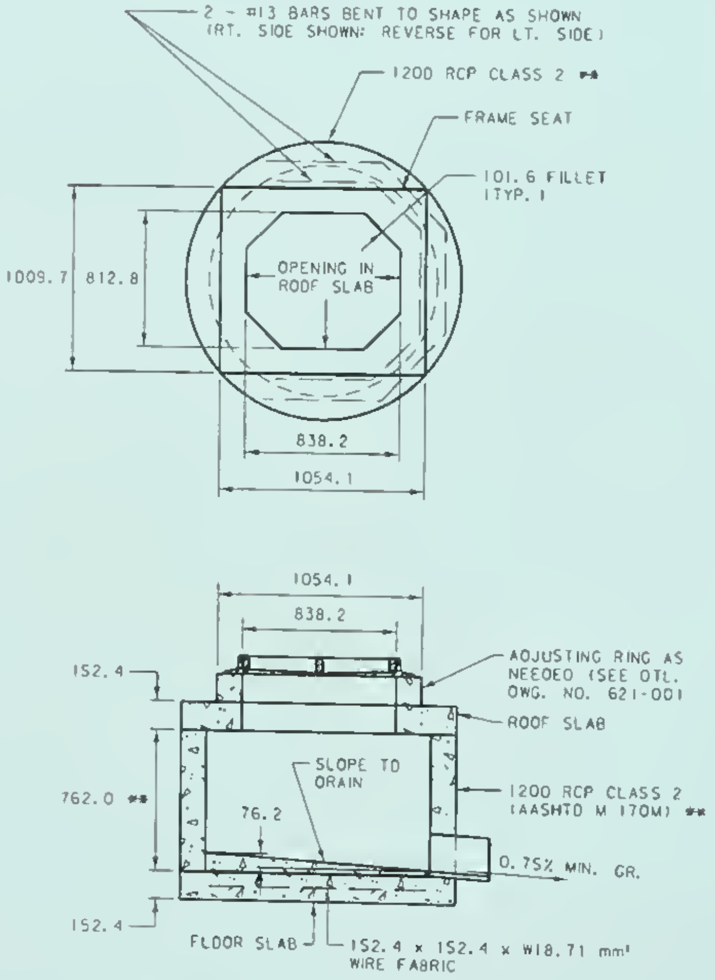
SECTION D-D



SECTION E-E

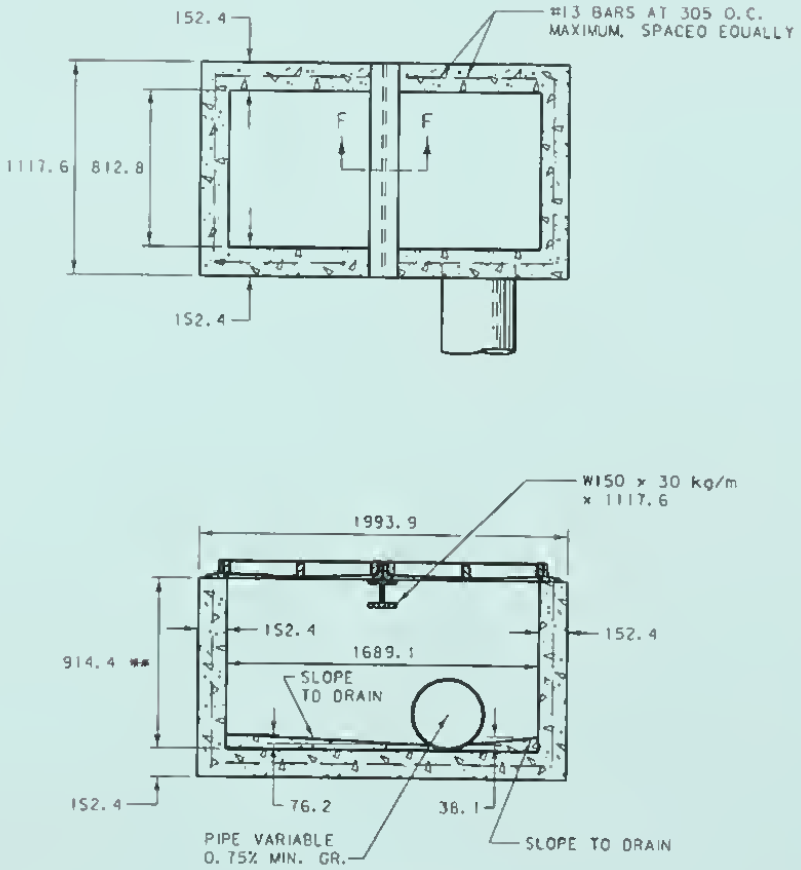


SECTION F-F
(FOR DOUBLE INLET)

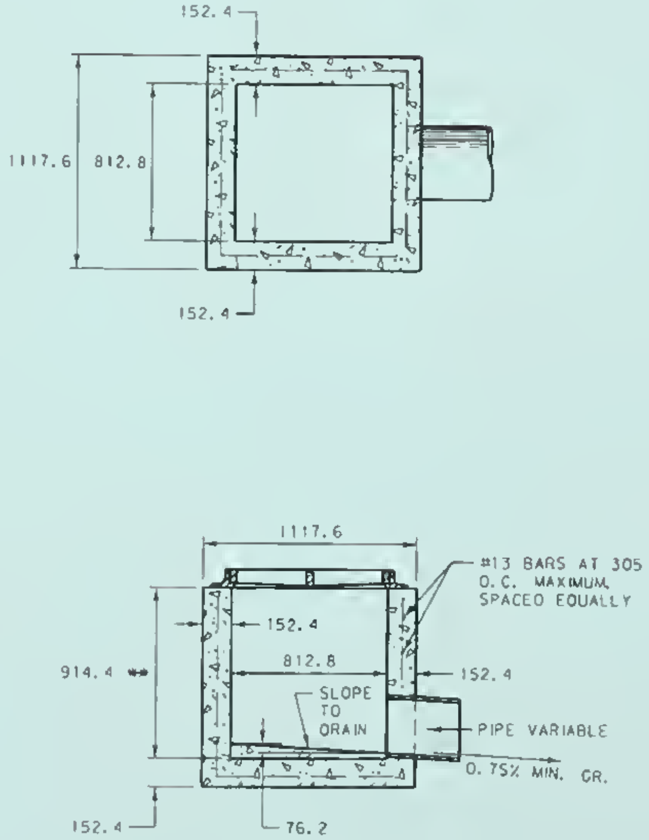


2 - #13 BARS BENT TO SHAPE AS SHOWN (RT. SIDE SHOWN: REVERSE FOR LT. SIDE)
1200 RCP CLASS 2 **
FRAME SEAT
101.6 FILLET (TYP.)
1009.7
812.8
OPENING IN ROOF SLAB
838.2
1054.1
1054.1
838.2
152.4
ADJUSTING RING AS NEEDED (SEE DTL. DWG. NO. 621-00)
ROOF SLAB
SLOPE TO DRAIN
762.0 **
76.2
1200 RCP CLASS 2 (AASHTO M 170M) **
0.75% MIN. GR.
152.4
FLOOR SLAB
152.4 x 152.4 x W18.71 mm² WIRE FABRIC

ROUND, SINGLE DROP INLET
TYPE I



DOUBLE DROP INLET
TYPE II



SINGLE DROP INLET
TYPE III

	QUANTITIES *	
	CONCRETE	REINF. STL.
TYPE I	0.344 m³	18.1 kg
TYPE II	1.147 m³	65.8 kg
TYPE III	0.765 m³	40.8 kg

* FOR ESTIMATING PURPOSES ONLY

NOTES:

ALL CONCRETE IS CLASS "DD" OR APPROVED EQUAL.

SEE PLANS FOR DETAILS AND QUANTITIES.

PLACE THE GRATE SO THE FIRST BAR IS A MAXIMUM OF 305 mm FROM THE BACK OF THE CURB.

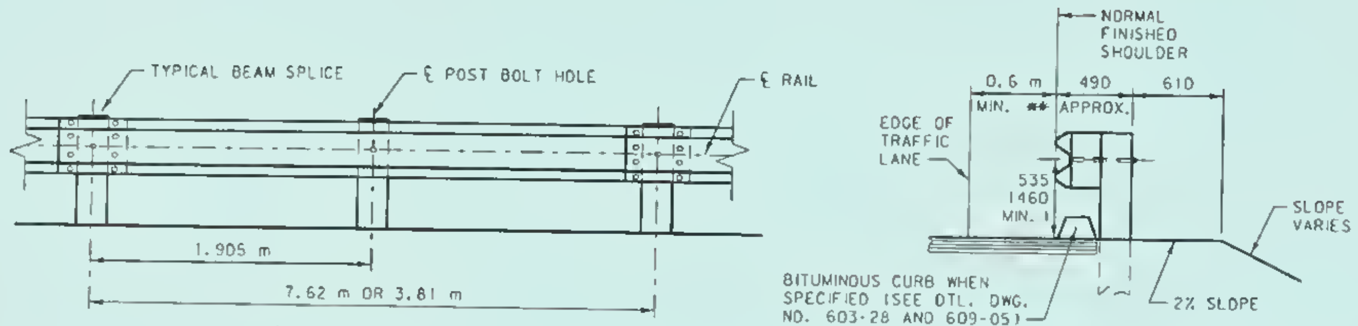
** STANDARD UNLESS OTHERWISE NOTED ON PLANS.

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 604
DWG. NO.
604-14

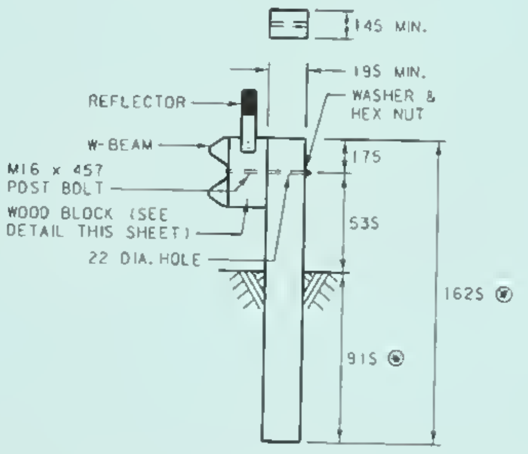
DROP INLETS

EFFECTIVE: AUGUST 1999
MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



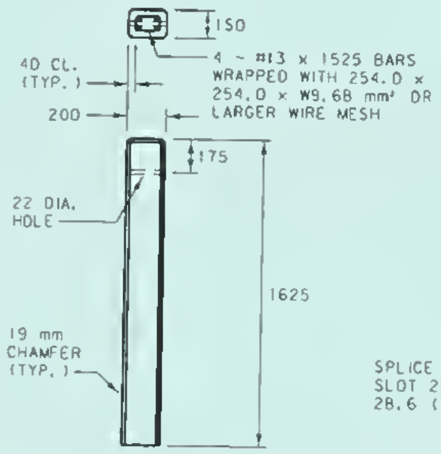
** WIDENING IS REQUIRED IF FINISHED SHOULDER IS LESS THAN 0.6 m FROM TRAFFIC LANE.

TYPICAL INSTALLATION

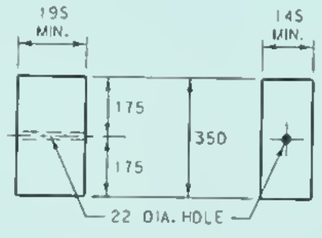


WOOD POST AND MOUNTING DETAIL

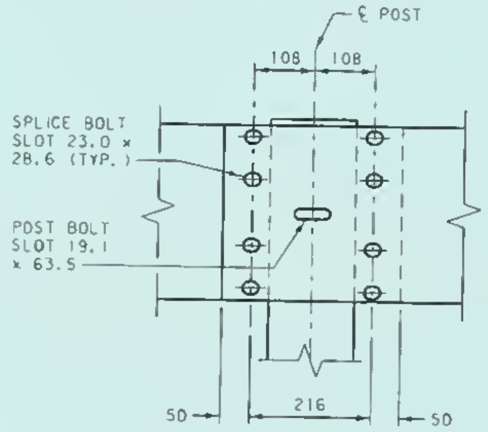
⊛ STANDARD UNLESS SPECIFIED OTHERWISE IN PLANS.


150
40 CL. (TYP.)
4 ~ #13 x 1525 BARS WRAPPED WITH 254.0 x 254.0 x W9.68 mm² OR LARGER WIRE MESH
200
175
22 DIA. HOLE
1625
19 mm CHAMFER (TYP.)

CONCRETE POST DETAIL

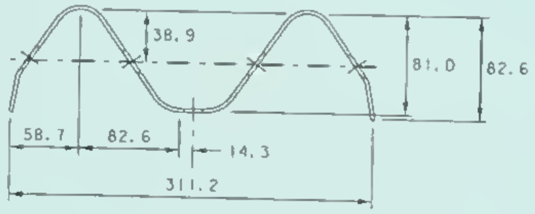


WOOD BLOCK


℄ POST
108
108
SPLICE BOLT SLOT 23.0 x 28.6 (TYP.)
POST BOLT SLOT 19.1 x 63.5
50
216
50

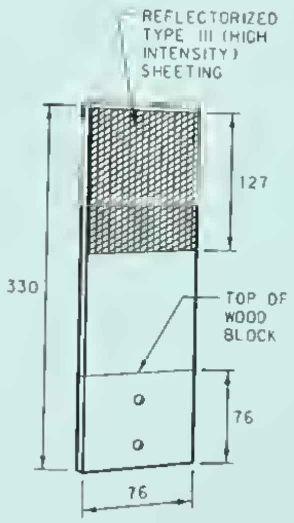
BEAM SPLICE

(LAP IN DIRECTION OF ADJACENT TRAFFIC)



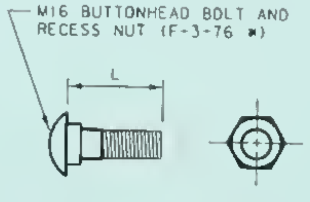
W-BEAM

RE-3-73 *



REFLECTOR

(SEE NOTES)



SPLICE BOLT, L = 31
POST BOLT, L = 457

SPLICE AND POST BOLT & NUT

NOTES:

INSTALL ALL BOLTS WITH HEADS ON TRAFFIC SIDE OF INSTALLATION.

AFFIX BLOCKS TO POSTS WITH CONSTRUCTION ADHESIVE OR TWO 16 PENNY GALV. NAILS OR 14 GAGE WIRE WRAP.

ATTACH REFLECTORS TO WOOD BLOCKS EVERY 7.62 m, WITH THE REFLECTORIZED SURFACE FACING ADJACENT TRAFFIC. FASTEN REFLECTOR TO BLOCK USING TWO 16 PENNY GALVANIZED NAILS AND TWO 4.8 mm DIA. WASHERS IN PRE-DRILLED HOLES.

* SEE DTL. DWG. NO. 606-80 FOR SCHEDULE OF GUARDRAIL HARDWARE.

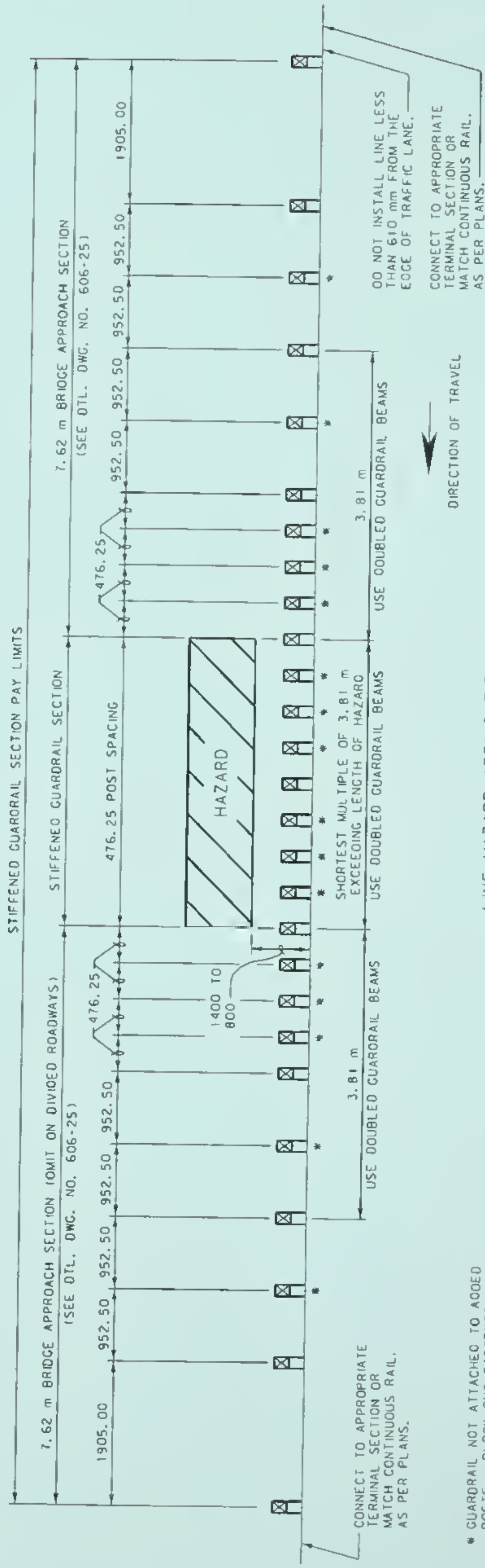
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE STANDARD SPEC. SECTION 606
DWG. NO. 606-05

METAL GUARDRAIL

EFFECTIVE: AUGUST 1999

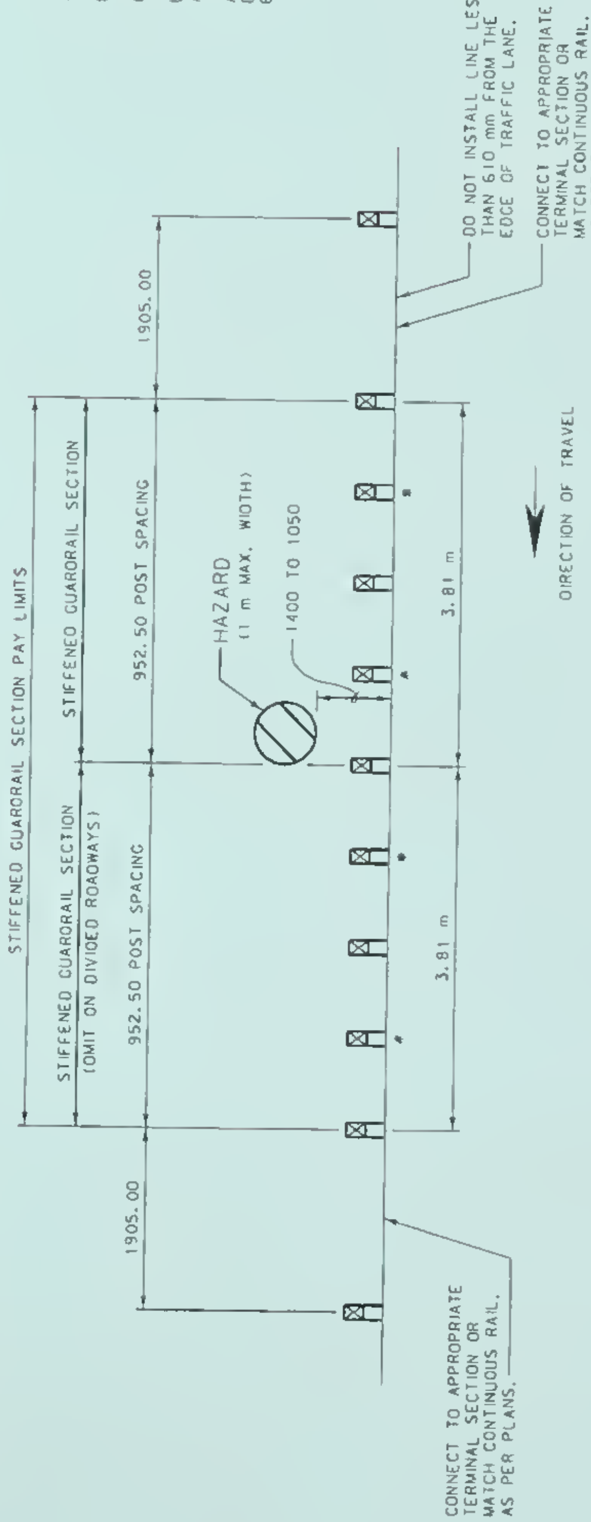
MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD


STIFFENED GUARDRAIL SECTION PAY LIMITS
7.62 m BRIDGE APPROACH SECTION (SEE DTL. DWG. NO. 606-25)
STIFFENED GUARDRAIL SECTION
476.25 POST SPACING
7.62 m BRIDGE APPROACH SECTION (OMIT ON DIVIDED ROADWAYS) (SEE DTL. DWG. NO. 606-25)
1905.00
952.50
476.25
HAZARD
1400 TO 800
3.81 m
USE DOUBLED GUARDRAIL BEAMS
SHORTEST MULTIPLE OF 3.81 m EXCEEDING LENGTH OF HAZARD
DO NOT INSTALL LINE LESS THAN 610 mm FROM THE EDGE OF TRAFFIC LANE.
CONNECT TO APPROPRIATE TERMINAL SECTION OR MATCH CONTINUOUS RAIL AS PER PLANS.
DIRECTION OF TRAVEL

LINE HAZARD APPLICATION

* GUARDRAIL NOT ATTACHED TO ADDED POSTS. BLOCK-OUT FASTENED TO POST WITH STANDARD POST BOLT.

GUARDRAIL ATTACHED TO POSTS ONLY AT STANDARD MULTIPLES OF 1.905 m THROUGH HAZARD SECTION.


STIFFENED GUARDRAIL SECTION PAY LIMITS
STIFFENED GUARDRAIL SECTION
STIFFENED GUARDRAIL SECTION (OMIT ON DIVIDED ROADWAYS)
952.50 POST SPACING
1905.00
HAZARD (1 m MAX. WIDTH)
1400 TO 1050
3.81 m
DO NOT INSTALL LINE LESS THAN 610 mm FROM THE EDGE OF TRAFFIC LANE.
CONNECT TO APPROPRIATE TERMINAL SECTION OR MATCH CONTINUOUS RAIL AS PER PLANS.
DIRECTION OF TRAVEL

POINT HAZARD APPLICATION

NOTES:

HAZARDS CLOSER TO THE INSTALLATION LINE THAN THE INDICATED LIMITS REQUIRE THE USE OF CONCRETE BARRIER RAIL.

LAP ALL DOUBLED RAIL IN THE DIRECTION OF ADJACENT TRAFFIC.

ALL POSTS AND BLOCKS ARE STANDARD DIMENSIONS AS PER DETAILED DRAWING NO. 606-05.

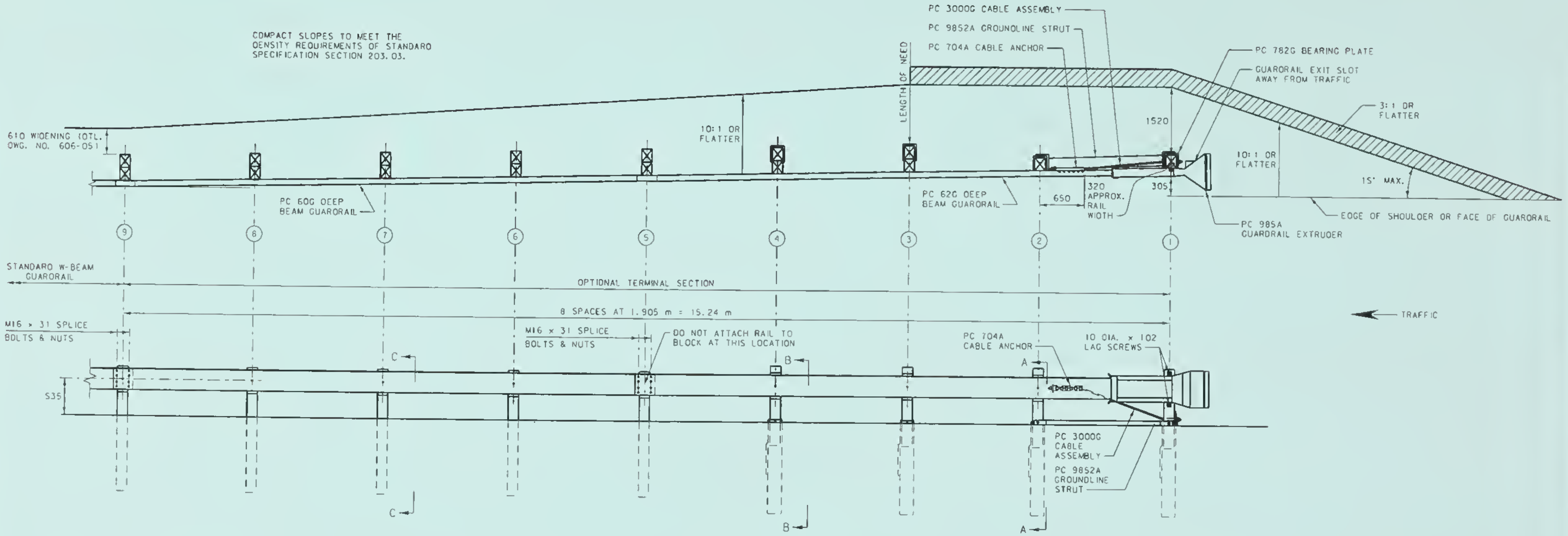
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

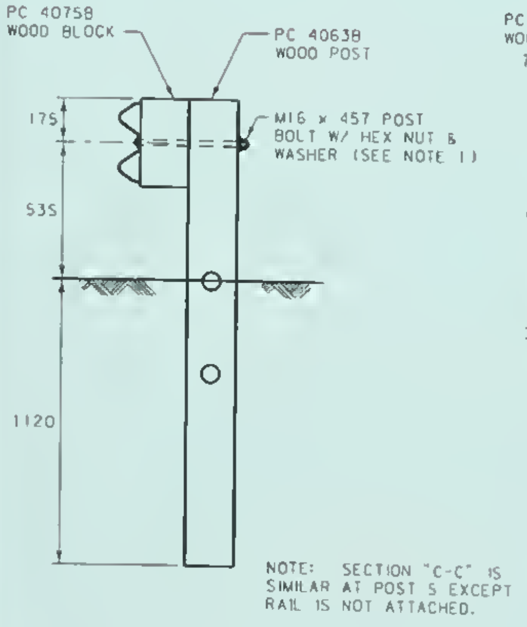
DETAILED DRAWING
REFERENCE STANDARD SPEC. SECTION 606
DWG. NO. 606-07

STIFFENED GUARDRAIL SECTIONS

EFFECTIVE: AUGUST 1999

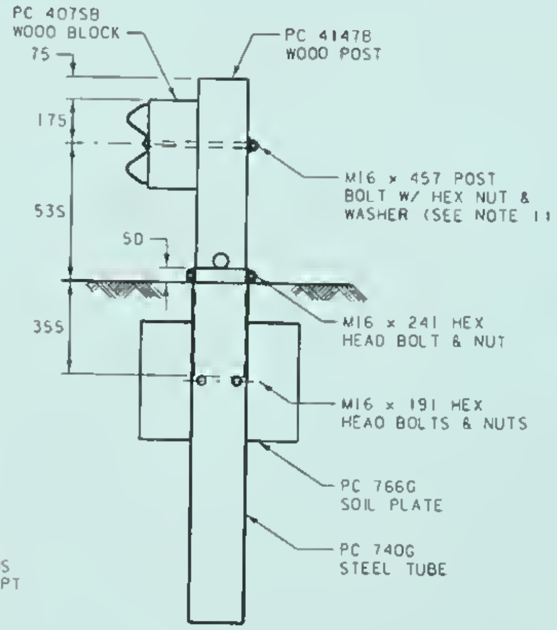
MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD


COMPACT SLOPES TO MEET THE DENSITY REQUIREMENTS OF STANDARD SPECIFICATION SECTION 203.03.
PC 3000G CABLE ASSEMBLY
PC 9852A GROUNDLINE STRUT
PC 704A CABLE ANCHOR
LENGTH OF NEED
PC 782G BEARING PLATE
GUARDRAIL EXIT SLOT AWAY FROM TRAFFIC
3:1 OR FLATTER
1520
10:1 OR FLATTER
10:1 OR FLATTER
15° MAX.
610 WIDENING (DTL. DWG. NO. 606-05)
PC 60G DEEP BEAM GUARDRAIL
PC 62G DEEP BEAM GUARDRAIL
650
320 APPROX. RAIL WIDTH
305
PC 985A GUARDRAIL EXTRUDER
EDGE OF SHOULDER OR FACE OF GUARDRAIL
9
8
7
6
5
4
3
2
1
STANDARD W-BEAM GUARDRAIL
OPTIONAL TERMINAL SECTION
8 SPACES AT 1.905 m = 15.24 m
TRAFFIC
M16 × 31 SPLICE BOLTS & NUTS
M16 × 31 SPLICE BOLTS & NUTS
DO NOT ATTACH RAIL TO BLOCK AT THIS LOCATION
C
B
A
PC 704A CABLE ANCHOR
10 DIA. × 102 LAG SCREWS
535
PC 3000G CABLE ASSEMBLY
PC 9852A GROUNDLINE STRUT

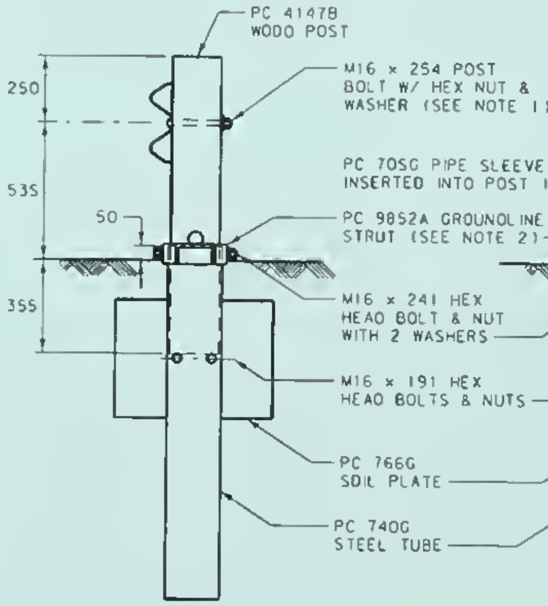


NOTE: SECTION "C-C" IS SIMILAR AT POST 5 EXCEPT RAIL IS NOT ATTACHED.

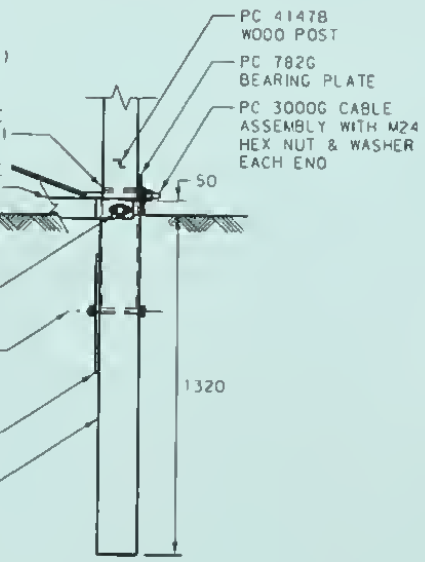
SECTION "C-C"
(TYP. AT POSTS 6, 7 AND 8)


PC 4075B WOOD BLOCK
75
PC 4147B WOOD POST
175
M16 × 457 POST BOLT W/ HEX NUT & WASHER (SEE NOTE 1)
535
50
355
M16 × 241 HEX HEAD BOLT & NUT
M16 × 191 HEX HEAD BOLTS & NUTS
PC 766G SOIL PLATE
PC 740G STEEL TUBE

SECTION "B-B"
(TYP. AT POSTS 3 AND 4)


PC 4147B WOOD POST
M16 × 254 POST BOLT W/ HEX NUT & WASHER (SEE NOTE 1)
250
535
50
355
PC 9852A GROUNDLINE STRUT (SEE NOTE 2)
M16 × 241 HEAD BOLT & NUT WITH 2 WASHERS
M16 × 191 HEX HEAD BOLTS & NUTS
PC 766G SOIL PLATE
PC 740G STEEL TUBE

SECTION "A-A"
(AT POST 2)


PC 705G PIPE SLEEVE INSERTED INTO POST 1
PC 4147B WOOD POST
PC 782G BEARING PLATE
PC 3000G CABLE ASSEMBLY WITH M24 HEX NUT & WASHER EACH END
50
1320

PARTIAL VIEW AT POST 1
(DO NOT ATTACH RAIL TO POST 1)

BILL OF MATERIAL		
PC	QTY	DESCRIPTION
60G	1	DEEP BEAM G.R. (12 GA., 2.7 THK.), 7.62 m
62G	1	DEEP BEAM G.R. (12 GA., 2.7 THK.), 7.62 m
704A	1	CABLE ANCHOR
705G	1	PIPE SLEEVE, 50 DIA. × 140
740G	4	STEEL TUBE, 152 × 203 × 1370
766G	4	SOIL PLATE, 460 × 610 × 6
782G	1	BEARING PLATE, 200 × 200 × 16
985A	1	GUARDRAIL EXTRUDER
3000G	1	CABLE ASSEMBLY
3300G	11	M16 WASHER
3340G	35	M16 NUT
3360G	16	M16 × 31 SPLICE BOLT
3478G	8	M16 × 191 HEX HEAD BOLT
3497G	4	M16 × 241 HEX HEAD BOLT
3500G	1	M16 × 254 POST BOLT
3580G	6	M16 × 457 POST BOLT
3900G	2	M24 WASHER
3910G	2	M24 HEX NUT
4063B	4	WOOD POST, 150 × 200 × 1830
4075B	6	WOOD BLOCK, 150 × 200 × 350
4147B	4	WOOD POST, 140 × 190 × 1145
4228G	2	10 DIA. × 102 LAG SCREW
9852A	1	GROUNDLINE STRUT (LEFT OR RIGHT)

NOTES:

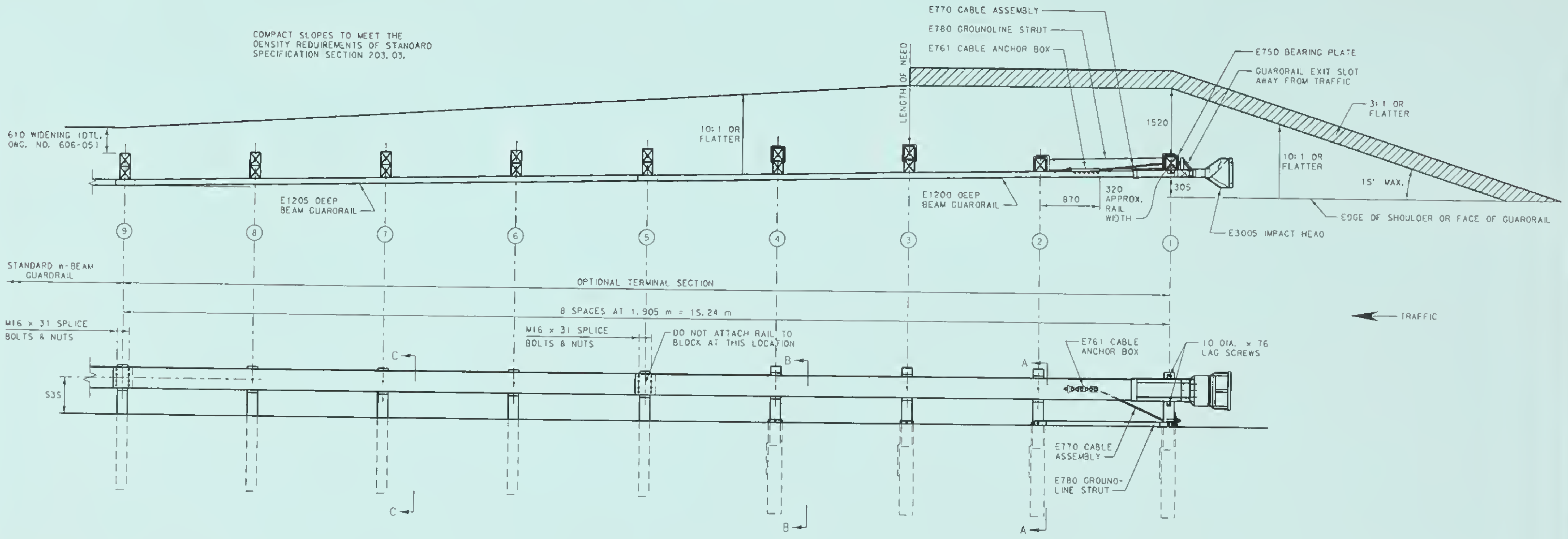
1. THE M16 FLAT WASHER IS USED UNDER THE NUT, BEHIND THE POST ONLY. NO WASHER IS USED AT THE RAIL.
2. STRUT CHANNEL IS SHOWN LEGS DOWN. FOR OPPOSITE HAND INSTALL LEGS UP.
3. USE THE ET-2000 TERMINAL SECTION ON DIVIDED ROADWAYS IF THE WIDTH IS 7.5 m OR GREATER BETWEEN FINISHED SURFACES. CONSIDER OTHER TERMINAL SECTIONS IF THE WIDTH IS LESS THAN 7.5 m BETWEEN FINISHED SURFACES.
4. FLARE THE END SECTION AWAY FROM TRAFFIC AT A RATE OF 50:1 FOR 15.24 m (ILLUSTRATED). FLARES OF 50:1 FOR 30.48 m MAY ALSO BE USED. THE FLARE MAY BE OMITTED ON ROADS WITH SHOULDERS GREATER THAN 0.6 m IN WIDTH.
5. PLACE A SELF-ADHESIVE OBJECT MARKER ON THE GUARDRAIL EXTRUDER FACE, HAVING ALTERNATING RETRO-REFLECTIVE BLACK AND YELLOW STRIPES SLOPED DOWNWARD AT AN ANGLE OF 45° TOWARDS THE SIDE ON WHICH TRAFFIC IS TO PASS.

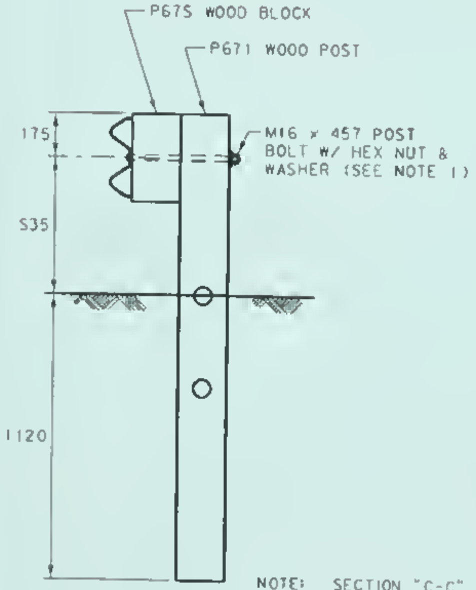
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 606
DWG. NO.
606-13A

OPTIONAL
TERMINAL SECTION -
ET-2000

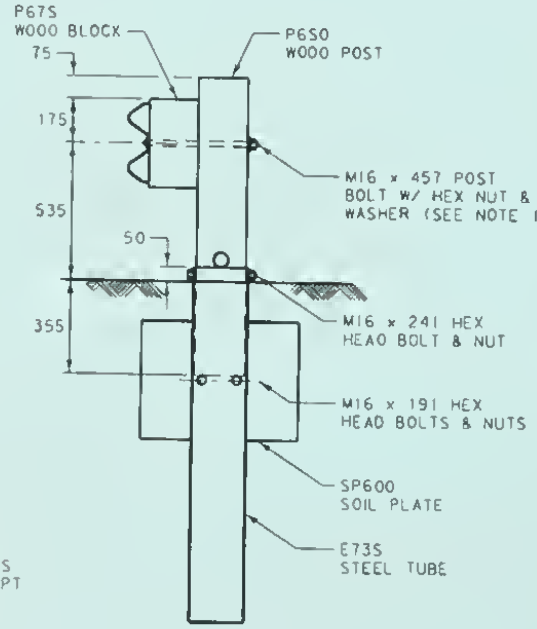
EFFECTIVE: AUGUST 1999
MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD


COMPACT SLOPES TO MEET THE DENSITY REQUIREMENTS OF STANDARD SPECIFICATION SECTION 203.03.
E770 CABLE ASSEMBLY
E780 GROUNDLINE STRUT
E761 CABLE ANCHOR BOX
E750 BEARING PLATE
GUARDRAIL EXIT SLOT AWAY FROM TRAFFIC
3:1 OR FLATTER
LENGTH OF NEED
1520
610 WIDENING (DTL. DWG. NO. 606-05)
10:1 OR FLATTER
10:1 OR FLATTER
15° MAX.
305
320 APPROX. RAIL WIDTH
870
E1205 DEEP BEAM GUARDRAIL
E1200 DEEP BEAM GUARDRAIL
EDGE OF SHOULDER OR FACE OF GUARDRAIL
E3005 IMPACT HEAD
9
8
7
6
5
4
3
2
1
STANDARD W-BEAM GUARDRAIL
OPTIONAL TERMINAL SECTION
8 SPACES AT 1.905 m = 15.24 m
TRAFFIC
M16 x 31 SPLICE BOLTS & NUTS
M16 x 31 SPLICE BOLTS & NUTS
DO NOT ATTACH RAIL TO BLOCK AT THIS LOCATION
C
C
B
B
A
A
535
E761 CABLE ANCHOR BOX
10 DIA. x 76 LAG SCREWS
E770 CABLE ASSEMBLY
E780 GROUND-LINE STRUT

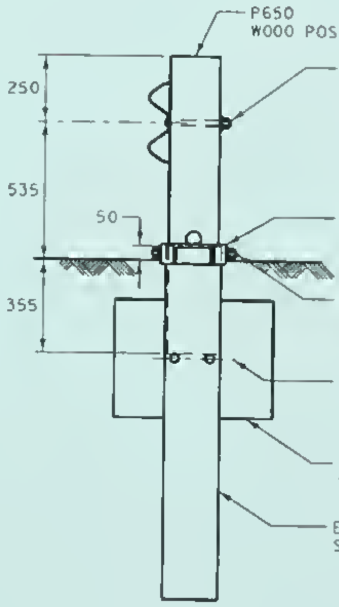


NOTE: SECTION "C-C" IS SIMILAR AT POST 5 EXCEPT RAIL IS NOT ATTACHED.

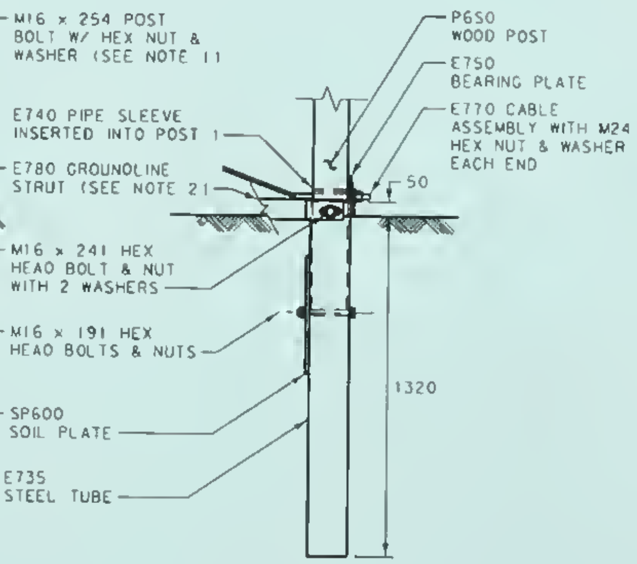
SECTION "C-C"
(TYP. AT POSTS 6, 7 AND 8)


P675 WOOD BLOCK
75
P650 WOOD POST
175
M16 x 457 POST BOLT W/ HEX NUT & WASHER (SEE NOTE 1)
535
50
355
M16 x 241 HEX HEAD BOLT & NUT
M16 x 191 HEX HEAD BOLTS & NUTS
SP600 SOIL PLATE
E735 STEEL TUBE

SECTION "B-B"
(TYP. AT POSTS 3 AND 4)


P650 WOOD POST
M16 x 254 POST BOLT W/ HEX NUT & WASHER (SEE NOTE 1)
250
535
50
355
E780 GROUNDLINE STRUT (SEE NOTE 2)
M16 x 241 HEX HEAD BOLT & NUT WITH 2 WASHERS
M16 x 191 HEX HEAD BOLTS & NUTS
SP600 SOIL PLATE
E735 STEEL TUBE

SECTION "A-A"
(AT POST 2)


E740 PIPE SLEEVE INSERTED INTO POST 1
P650 WOOD POST
E750 BEARING PLATE
E770 CABLE ASSEMBLY WITH M24 HEX NUT & WASHER EACH END
50
1320

PARTIAL VIEW AT POST 1
(DO NOT ATTACH RAIL TO POST 1)

BILL OF MATERIAL		
CODE	QTY	DESCRIPTION
E1200	1	DEEP BEAM G.R. (12 GA., 2.7 THK.), 8089.9
E1205	1	DEEP BEAM G.R. (12 GA., 2.7 THK.), 7937.5
E735	4	STEEL TUBE, 152 x 203 x 1370
SP600	4	SOIL PLATE, 460 x 610 x 6
E740	1	PIPE SLEEVE, 50 DIA. x 140
E750	1	BEARING PLATE, 200 x 200 x 16
E761	1	CABLE ANCHOR BOX
E770	1	CABLE ASSEMBLY
E780	1	GROUNDLINE STRUT (LEFT OR RIGHT)
E3005	1	BEST IMPACT HEAD
P650	4	WOOD POST, 140 x 190 x 1145
P671	4	WOOD CRT POST, 150 x 200 x 1830
P675	6	WOOD BLOCK, 150 x 200 x 350
BS80122	16	M16 x 31 SPLICE BOLT
BS80754	8	M16 x 191 HEX HEAD BOLT
BS80954	4	M16 x 241 HEX HEAD BOLT
BS81002	1	M16 x 254 POST BOLT
BS81802	6	M16 x 457 POST BOLT
E350	2	10 x 76 LAG SCREW
N050	35	M16 NUT
W050	11	M16 FLAT WASHER
N100	2	M24 HEX NUT
W100	2	M24 WASHER

NOTES:

1. THE M16 FLAT WASHER IS USED UNDER THE NUT, BEHIND THE POST ONLY. NO WASHER IS USED AT THE RAIL.
2. STRUT CHANNEL IS SHOWN LEGS DOWN. FOR OPPOSITE HAND INSTALL LEGS UP.
3. USE THE BEST TERMINAL SECTION ON DIVIDED ROADWAYS IF THE WIDTH IS 7.5 m OR GREATER BETWEEN FINISHED SURFACES. CONSIDER OTHER TERMINAL SECTIONS IF THE WIDTH IS LESS THAN 7.5 m BETWEEN FINISHED SURFACES.
4. FLARE THE END SECTION AWAY FROM TRAFFIC AT A RATE OF 50:1 FOR 15.24 m (ILLUSTRATED). FLARES OF 50:1 FOR 30.48 m MAY ALSO BE USED. THE FLARE MAY BE OMITTED ON ROADS WITH SHOULDERS GREATER THAN 0.6 m IN WIDTH.
5. PLACE A SELF-ADHESIVE OBJECT MARKER ON THE GUARDRAIL EXTRUDER FACE, HAVING ALTERNATING RETRO-REFLECTIVE BLACK AND YELLOW STRIPES SLOPED DOWNWARD AT AN ANGLE OF 45° TOWARDS THE SIDE ON WHICH TRAFFIC IS TO PASS.

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 606
DWG. NO.
606-13B

OPTIONAL
TERMINAL SECTION -
BEST

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

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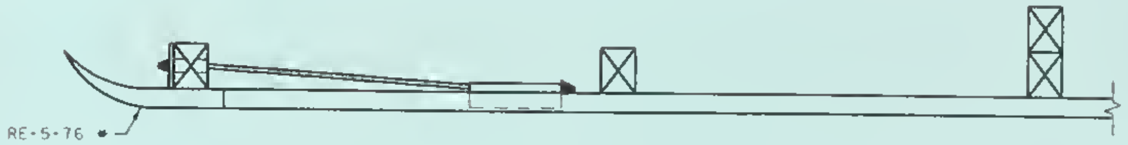
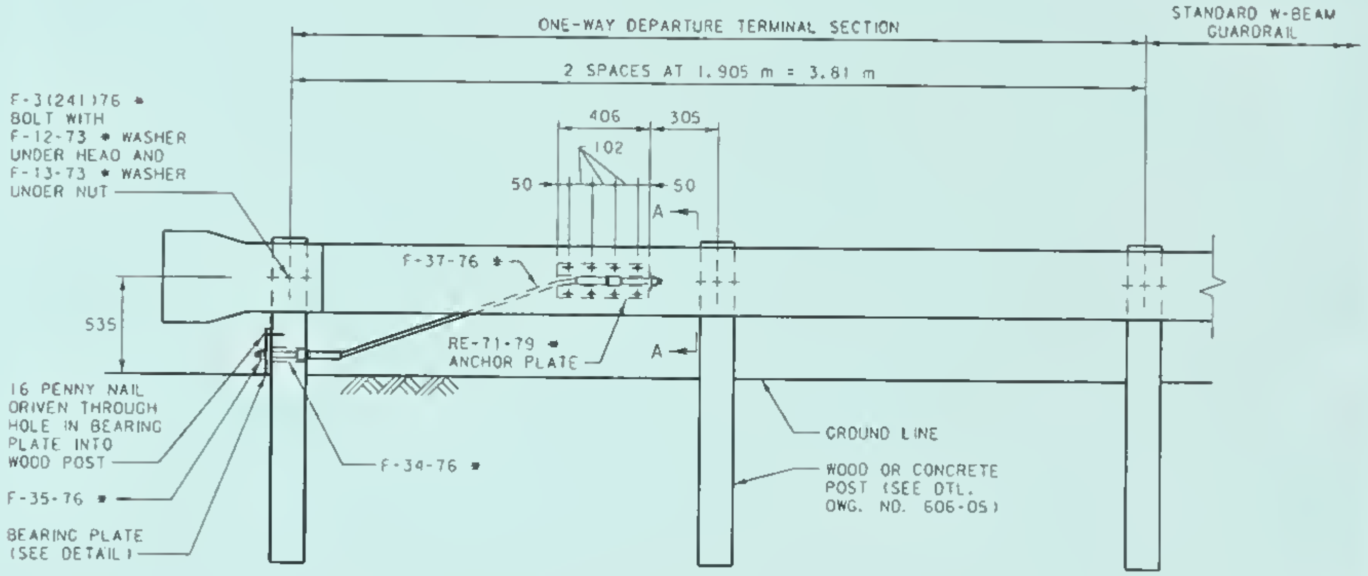
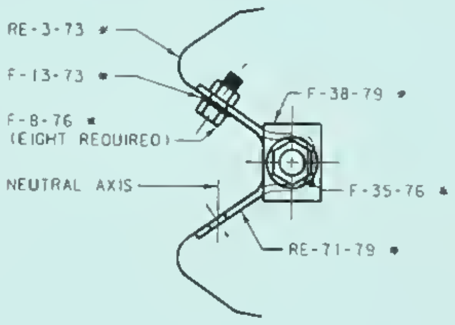


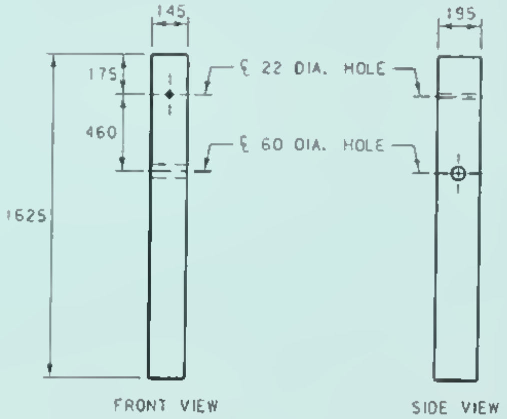
PLAN


ONE-WAY DEPARTURE TERMINAL SECTION
STANDARD W-BEAM GUARDRAIL
2 SPACES AT 1.905 m = 3.81 m
406
305
102
50
50
A
A
F-3(241)76 * BOLT WITH F-12-73 * WASHER UNDER HEAD AND F-13-73 * WASHER UNDER NUT
F-37-76 *
535
RE-71-79 * ANCHOR PLATE
16 PENNY NAIL DRIVEN THROUGH HOLE IN BEARING PLATE INTO WOOD POST
F-35-76 *
BEARING PLATE (SEE DETAIL)
F-34-76 *
GROUND LINE
WOOD OR CONCRETE POST (SEE DTL. DWG. NO. 606-05)

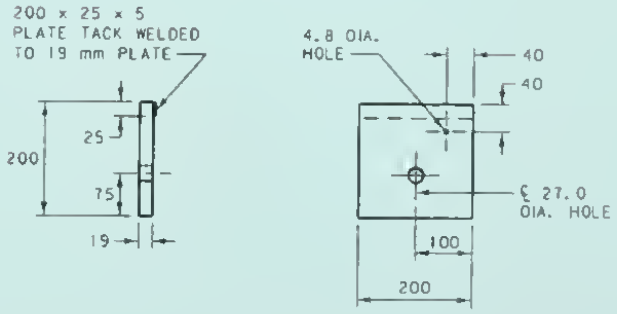
ELEVATION



SECTION A-A



END POST DETAILS



BEARING PLATE DETAIL

NOTE:
* SEE DTL. DWG. NO. 606-80 FOR SCHEDULE OF GUARDRAIL HARDWARE.

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING

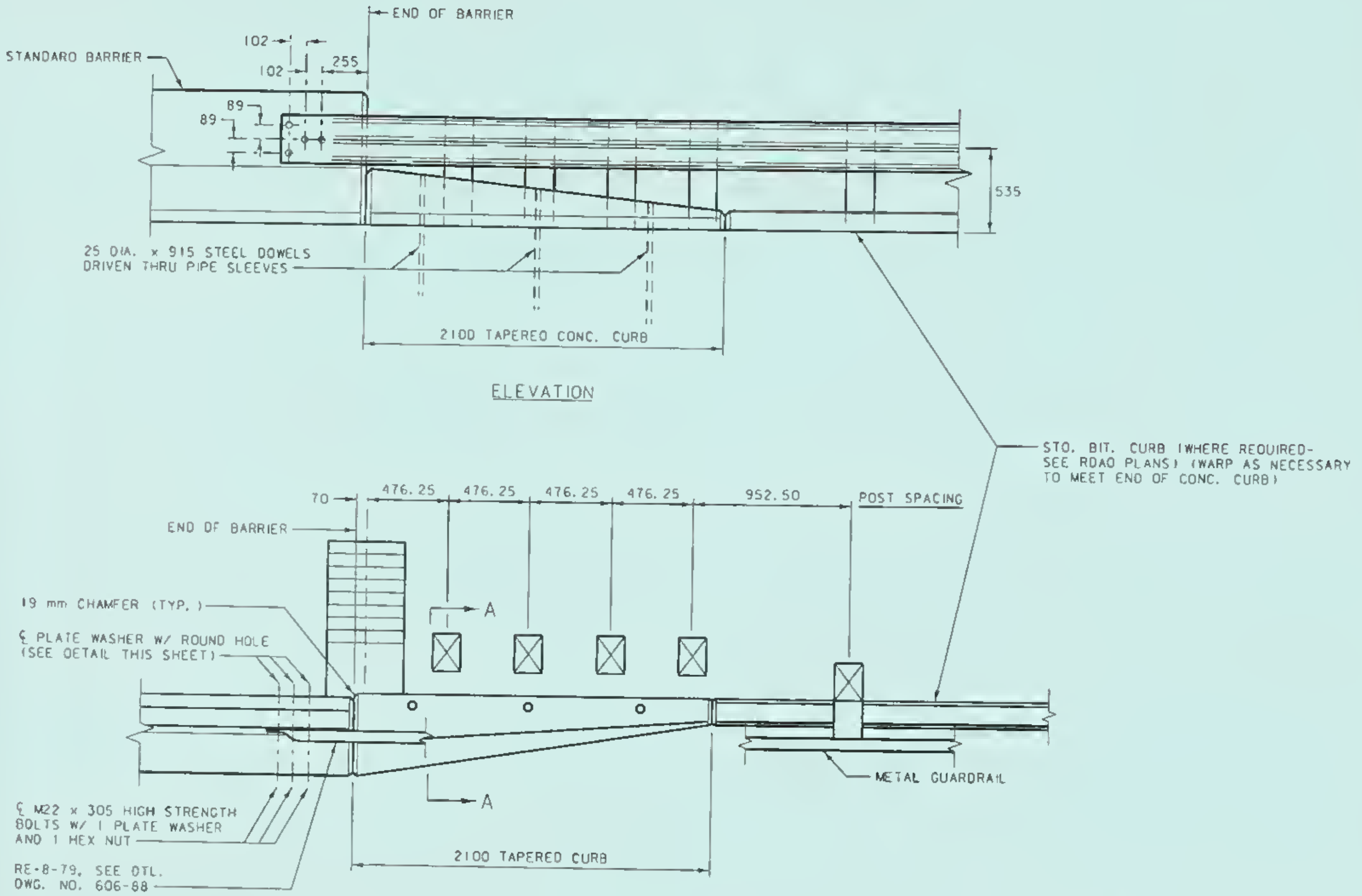
REFERENCE
STANDARD SPEC.
SECTION 606

DWG. NO.
606-18

ONE-WAY DEPARTURE
TERMINAL SECTION

EFFECTIVE: AUGUST 1999

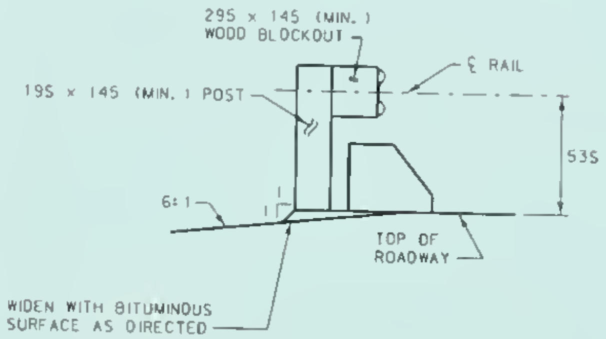
MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD


END OF BARRIER
STANDARD BARRIER
102
102
255
89
89
535
25 DIA. × 915 STEEL DOWELS DRIVEN THRU PIPE SLEEVES
2100 TAPERED CONC. CURB
STD. BIT. CURB (WHERE REQUIRED-SEE ROAD PLANS) (WARP AS NECESSARY TO MEET END OF CONC. CURB)
70
476.25
476.25
476.25
476.25
952.50
POST SPACING
END OF BARRIER
19 mm CHAMFER (TYP.)
℄ PLATE WASHER W/ ROUND HOLE (SEE DETAIL THIS SHEET)
A
A
METAL GUARDRAIL
℄ M22 × 305 HIGH STRENGTH BOLTS W/ 1 PLATE WASHER AND 1 HEX NUT
RE-8-79, SEE DTL. DWG. NO. 606-88
2100 TAPERED CURB

ELEVATION

PLAN

DETAIL "A"


295 × 145 (MIN.) WOOD BLOCKOUT
℄ RAIL
195 × 145 (MIN.) POST
535
6:1
TOP OF ROADWAY
WIDEN WITH BITUMINOUS SURFACE AS DIRECTED

SECTION A-A

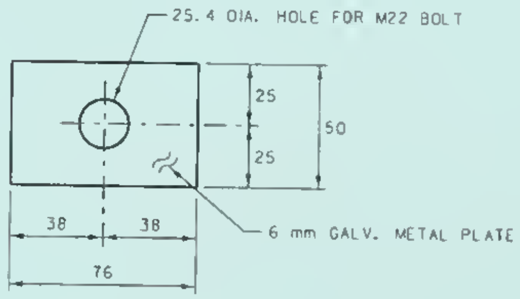


PLATE WASHER

NOTES:

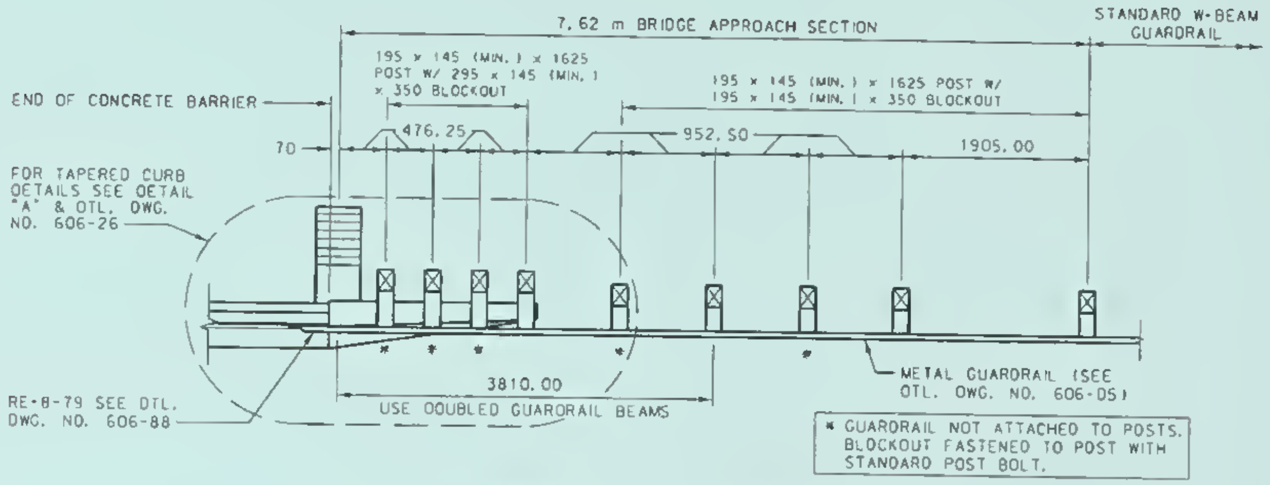
TAPERED CONCRETE CURBS:
TYPE 1, SEE DTL. DWG. NO. 606-26
TYPE 3, SEE DTL. DWG. NO. 606-27

CURB TAPERS ARE NOT REQUIRED WHEN EXISTING APPROACH SLABS ARE IN PLACE.

PORTIONS OF GUARDRAIL & BLOCKOUTS ARE OMITTED FOR CLARITY.

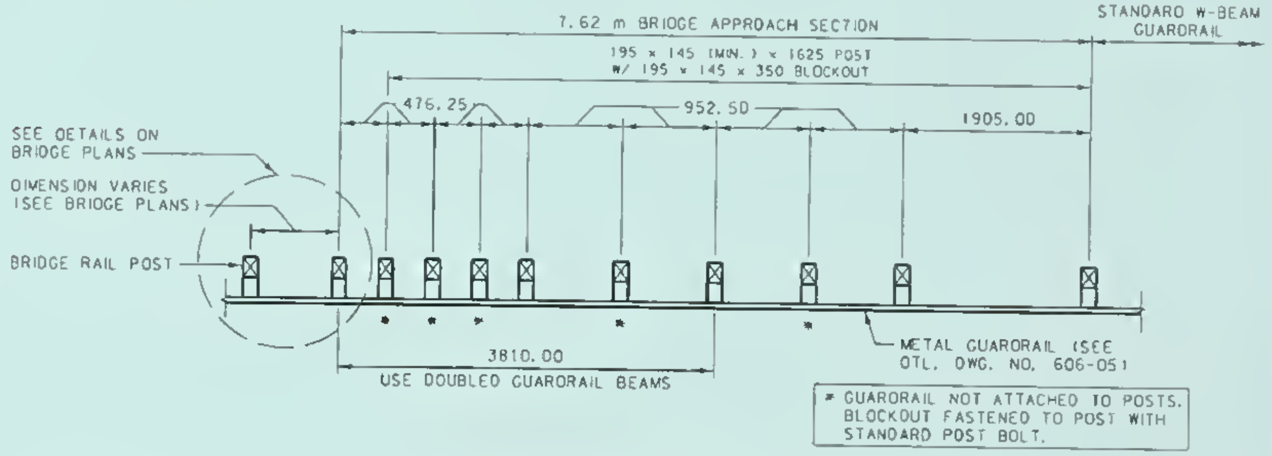
LAP GUARDRAIL IN THE DIRECTON OF THE ADJACENT TRAFFIC LANE. (SEE DTL. DWG. NO. 606-05.)

DO NOT FLARE BRIDGE APPROACH SECTIONS.


7.62 m BRIDGE APPROACH SECTION
STANDARD W-BEAM GUARDRAIL
195 × 145 (MIN.) × 1625 POST W/ 295 × 145 (MIN.) × 350 BLOCKOUT
195 × 145 (MIN.) × 1625 POST W/ 195 × 145 (MIN.) × 350 BLOCKOUT
END OF CONCRETE BARRIER
70
476.25
952.50
1905.00
FOR TAPERED CURB DETAILS SEE DETAIL "A" & DTL. DWG. NO. 606-26
RE-8-79 SEE DTL. DWG. NO. 606-88
3810.00
USE DOUBLED GUARDRAIL BEAMS
METAL GUARDRAIL (SEE DTL. DWG. NO. 606-05)
* GUARDRAIL NOT ATTACHED TO POSTS. BLOCKOUT FASTENED TO POST WITH STANDARD POST BOLT.

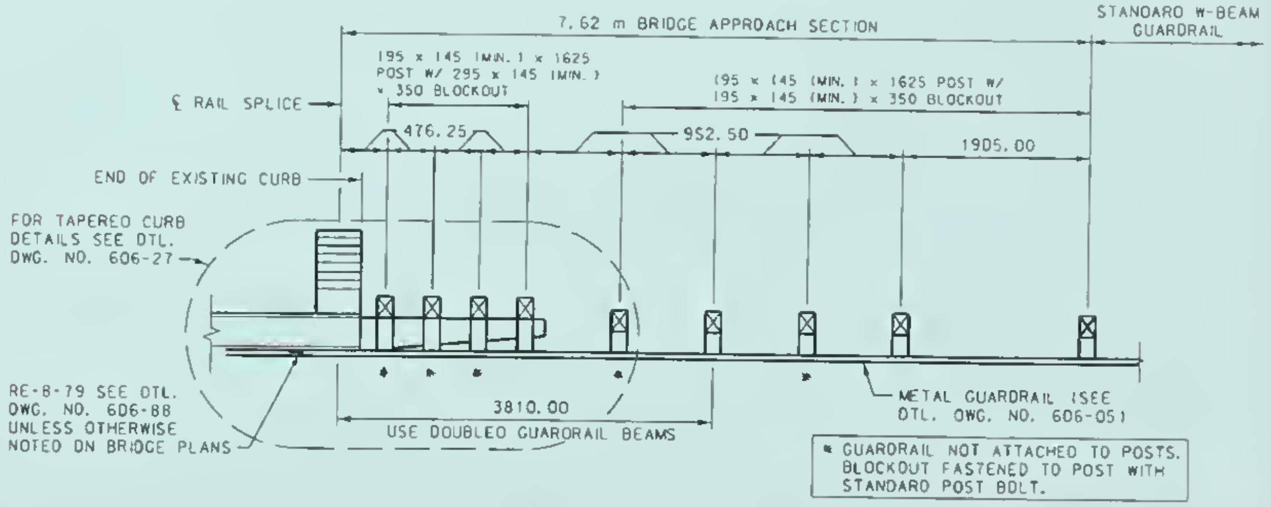
METAL GUARDRAIL-BRIDGE APPROACH SECTION TYPE 1

(FOR BRIDGES USING CONCRETE BARRIER RAIL)


7.62 m BRIDGE APPROACH SECTION
STANDARD W-BEAM GUARDRAIL
195 × 145 (MIN.) × 1625 POST W/ 195 × 145 × 350 BLOCKOUT
476.25
952.50
1905.00
SEE DETAILS ON BRIDGE PLANS
DIMENSION VARIES (SEE BRIDGE PLANS)
BRIDGE RAIL POST
3810.00
USE DOUBLED GUARDRAIL BEAMS
METAL GUARDRAIL (SEE DTL. DWG. NO. 606-05)
* GUARDRAIL NOT ATTACHED TO POSTS. BLOCKOUT FASTENED TO POST WITH STANDARD POST BOLT.

METAL GUARDRAIL-BRIDGE APPROACH SECTION TYPE 2

(FOR BRIDGES WITHOUT CURBS)


7.62 m BRIDGE APPROACH SECTION
STANDARD W-BEAM GUARDRAIL
195 × 145 (MIN.) × 1625 POST W/ 295 × 145 (MIN.) × 350 BLOCKOUT
195 × 145 (MIN.) × 1625 POST W/ 195 × 145 (MIN.) × 350 BLOCKOUT
℄ RAIL SPLICE
476.25
952.50
1905.00
END OF EXISTING CURB
FOR TAPERED CURB DETAILS SEE DTL. DWG. NO. 606-27
RE-8-79 SEE DTL. DWG. NO. 606-88 UNLESS OTHERWISE NOTED ON BRIDGE PLANS
3810.00
USE DOUBLED GUARDRAIL BEAMS
METAL GUARDRAIL (SEE DTL. DWG. NO. 606-05)
* GUARDRAIL NOT ATTACHED TO POSTS. BLOCKOUT FASTENED TO POST WITH STANDARD POST BOLT.

METAL GUARDRAIL-BRIDGE APPROACH SECTION TYPE 3

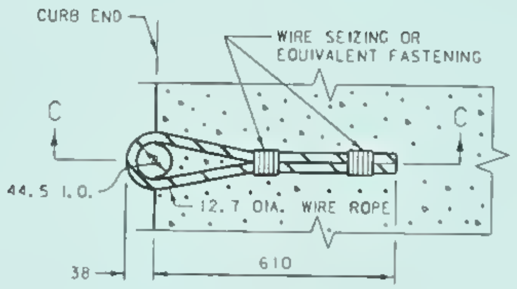
(FOR BRIDGES WITH EXISTING CONCRETE CURBS)

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 606
DWG. NO.
606-25

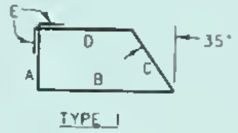
BRIDGE APPROACH
SECTIONS

EFFECTIVE: AUGUST 1999
MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



WIRE ROPE DETAIL

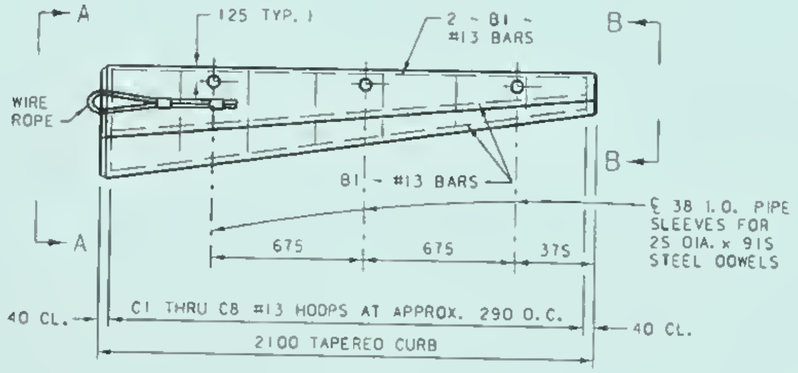
BILL OF REINFORCING STEEL (ONE SECTION ONLY)



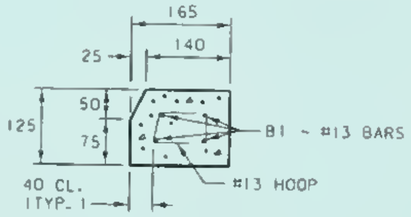
TYPE I

BENT BARS (ALL DIMENSIONS ARE OUT TO OUT)

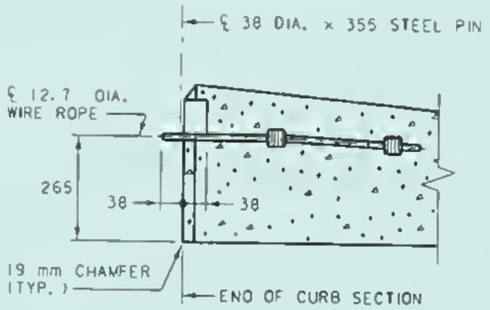
MARK	SIZE	NO.	TYPE	LENGTH	A	B	C	D	E
C1	#13	1	1	1360	270	395	330	205	80
C2				1225	240	350	290	185	
C3				1090	205	310	255	160	
C4				955	175	265	215	140	
C5				820	145	220	175	120	
C6				695	115	180	140	100	
C7				555	80	135	100	80	
C8		1	1	415	50	90	60	55	80
B1	#13	4	STRAIGHT	2020	~	~	~	~	~


A
A
B
B
125 TYP.
2 ~ B1 ~ #13 BARS
WIRE ROPE
B1 ~ #13 BARS
℄ 38 I.D. PIPE SLEEVES FOR 25 DIA. x 915 STEEL DOWELS
675
675
375
40 CL.
C1 THRU C8 #13 HOOPS AT APPROX. 290 O.C.
40 CL.
2100 TAPERED CURB

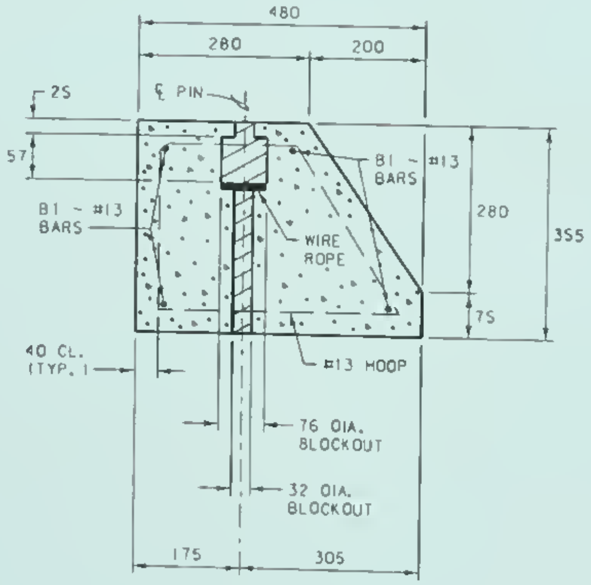
PLAN



VIEW B-B



SECTION C-C



VIEW A-A

NOTES:

TAPERED CONCRETE CURB IS USED WITH BRIDGE APPROACH SECTION TYPE 1 (SEE DTL. DWG. NO. 606-25).

WIRE ROPE CONSISTS OF ZINC-COATED STEEL WIRE 7 STRAND UTILITY GRADE WITH A MINIMUM BREAKING STRENGTH OF 111.2 kN, CONFORMING TO ASTM SPECIFICATION A 475.

ALL REINFORCING STEEL IS OF THE DEFORMED TYPE, MEETING THE REQUIREMENTS OF AASHTO M 31M (ASTM A 615M, GRADE 420).

ALL CONCRETE IS CLASS "DD".
TOTAL CONCRETE PER 2100 mm TAPERED CURB EST. = 0.17 m³.
TOTAL REBAR WEIGHT PER 2100 mm TAPERED CURB EST. = 15.1 kg.

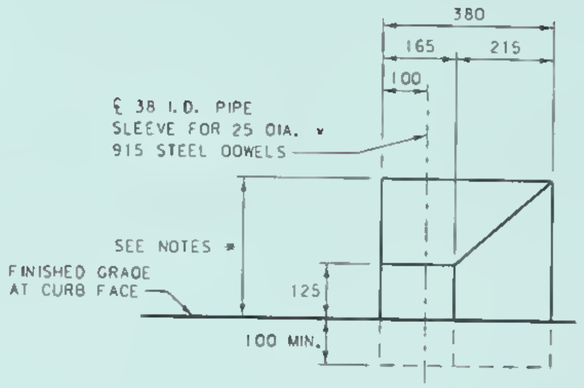
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 606
DWG. NO.
606-26

TAPERED CONCRETE
CURB DETAIL

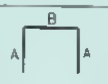
EFFECTIVE: AUGUST 1999

MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD


380
165
215
100
℄ 38 I.D. PIPE SLEEVE FOR 25 DIA. x 915 STEEL DOWELS
SEE NOTES *
FINISHED GRADE AT CURB FACE
125
100 MIN.

END VIEW

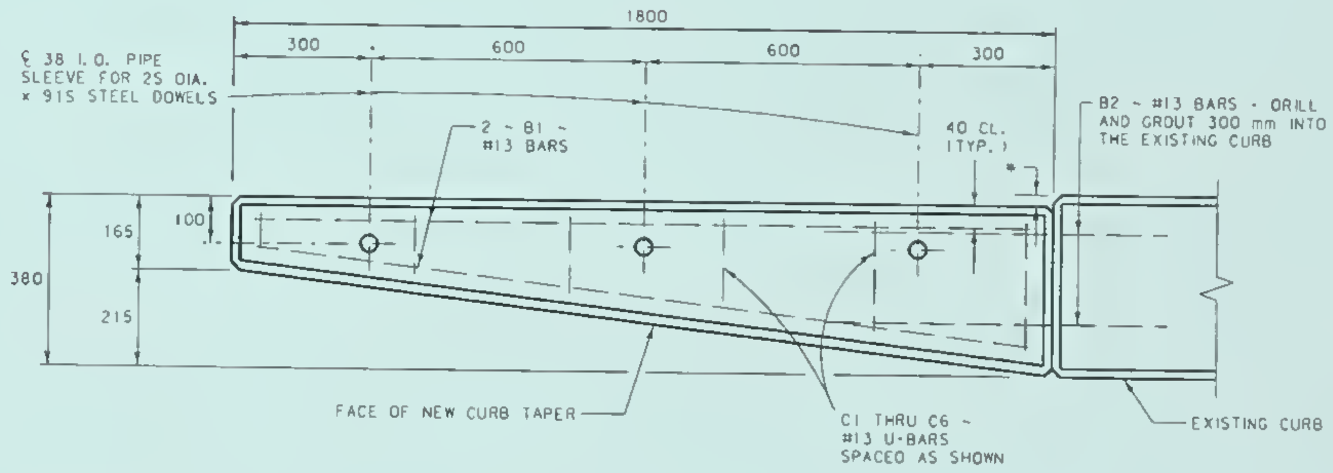
BILL OF REINFORCING STEEL (ONE SECTION ONLY)



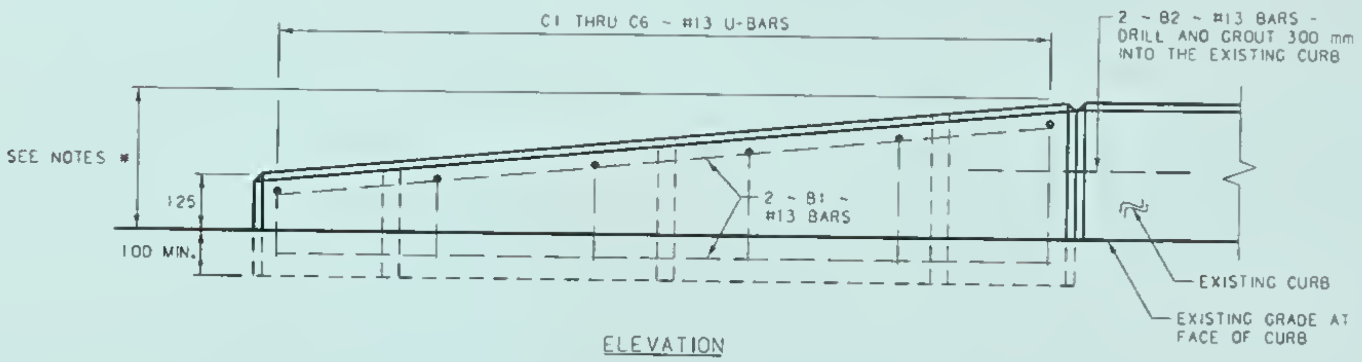
TYPE I

BENT BARS (ALL DIMENSIONS ARE OUT TO OUT)

MARK	SIZE	NO.	TYPE	LENGTH	A	B
C1	#13	1	1	390	150	90
C2				480	175	130
C3				570	200	170
C4				665	225	215
C5				755	250	255
C6		1	1	845	270	295
B1		4	STRAIGHT	1720	~	~
B2	#13	2	STRAIGHT	600	~	~


1800
300
600
600
300
℄ 38 I.D. PIPE SLEEVE FOR 25 DIA. x 915 STEEL DOWELS
2 ~ B1 ~ #13 BARS
40 CL. (TYP.)
B2 ~ #13 BARS - DRILL AND GROUT 300 mm INTO THE EXISTING CURB
165
100
380
215
FACE OF NEW CURB TAPER
C1 THRU C6 ~ #13 U-BARS SPACED AS SHOWN
EXISTING CURB

PLAN


C1 THRU C6 ~ #13 U-BARS
2 ~ B2 ~ #13 BARS - DRILL AND GROUT 300 mm INTO THE EXISTING CURB
SEE NOTES *
125
100 MIN.
2 ~ B1 ~ #13 BARS
EXISTING CURB
EXISTING GRADE AT FACE OF CURB

ELEVATION

NOTES:

REMOVE THE EXISTING SURFACE UNDER THE NEW CONCRETE CURB TAPERS AS APPROVED BY THE ENGINEER. EMBED THE CURB TAPER A MINIMUM OF 100 mm BELOW THE GRADE MEASURED AT THE INSIDE FACE OF THE TAPER.

ALL REINFORCING STEEL IS OF THE DEFORMED TYPE, MEETING THE REQUIREMENTS OF AASHTO M 31M (ASTM A 615M, GRADE 420).

ALL CONCRETE IS CLASS "DD".
TOTAL CONCRETE PER 1800 mm TAPERED CURB EST. = 0.16 m³.
TOTAL REBAR WEIGHT PER 1800 mm TAPERED CURB EST. = 11.7 kg.

TAPERED CONCRETE CURB IS USED WITH BRIDGE APPROACH SECTION TYPE 3 (SEE DTL. DWG. NO. 606-25).

* ADJUST DIMENSION TO MATCH EXISTING CURB.

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 606
DWG. NO.
606-27

TAPERED CONCRETE
CURB DETAIL

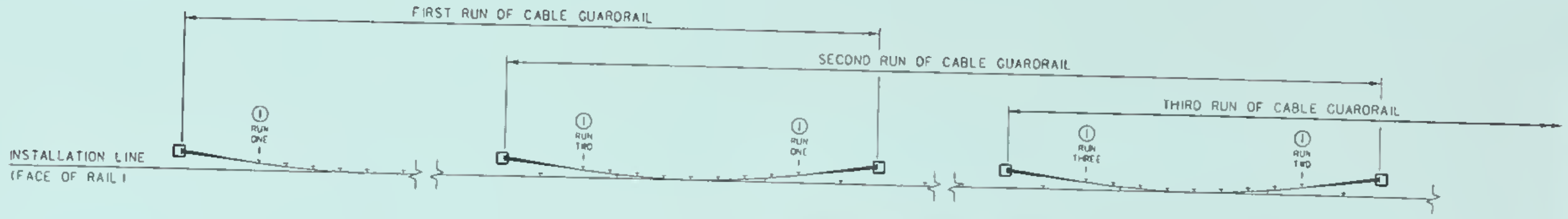
EFFECTIVE: AUGUST 1999

MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

TERMINAL DETAILS						
POST	DISTANCE FROM ANCHOR	OFFSET FROM INSTALL. LINE	CABLE FASTENER			BASE PLATES
			TYPE	QUANTITY	DESCRIPTION	
5	12 800	0	F-1-76	3	HOOK BOLT	~
4	10 970	50	F-1-76	3	HOOK BOLT	~
3	9140	150	F-1-76	3	HOOK BOLT	~
2	7310	300	P-2-79	1	END CAP	P-2-79
1	5480	500	P-2-79	1	END CAP	P-2-79
ANCHOR	0	1220	THREE CABLE END ASSEMBLIES *			

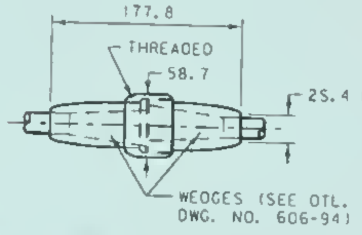
SCHEDULE OF HARDWARE *		
DESIGNATION	DESCRIPTION	DTL. DWG. NO.
F-1-76	M8 HOOK BOLT	606-82
F-10(1141-79	M20 HEX BOLT & NUT & WASHER	606-82
P-1-76	STRUCTURAL SHAPE LINE POST (STEEL)	606-92
P-2-79	END POST FITTINGS	606-90
P-46-76	BENT PLATE LINE POST (STEEL)	606-92
RE-1-76	19.1 DIA. WIRE ROPE (3x7)	606-94

* SEE ARTBA TECHNICAL BULLETIN NO. 268-B (AGC STD. FORM NO. 1311 "A GUIDE TO STANDARDIZED HIGHWAY BARRIER RAIL HARDWARE."


FIRST RUN OF CABLE GUARDRAIL
SECOND RUN OF CABLE GUARDRAIL
THIRD RUN OF CABLE GUARDRAIL
INSTALLATION LINE
(FACE OF RAIL)
① RUN ONE
① RUN TWO
① RUN ONE
① RUN THREE
① RUN TWO

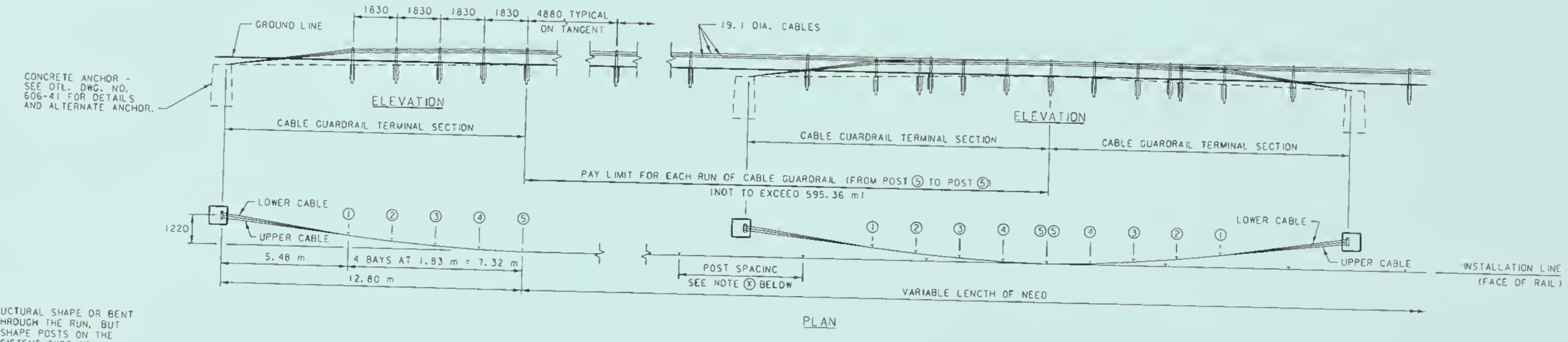
TYPICAL LAYOUT FOR MULTIPLE RUNS OF CABLE GUARDRAIL

EACH RUN OF CABLE GUARDRAIL CONTAINS TWO TERMINAL SECTIONS WITH ANCHOR ASSEMBLIES.

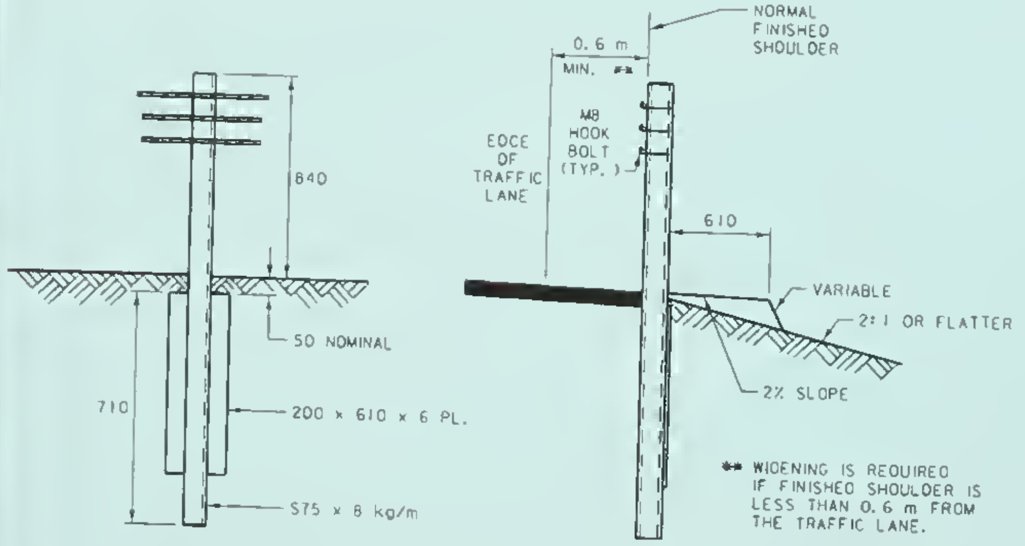


SPLICE CABLE USING A COUPLING DEVICE AS SHOWN, OR AN ALTERNATE METHOD APPROVED BY THE ENGINEER.

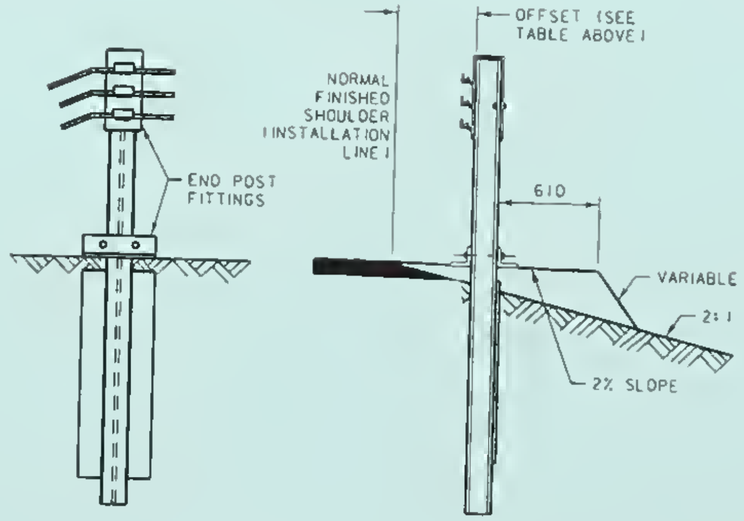
CABLE SPLICE



NOTE:
EITHER LINE POST (STRUCTURAL SHAPE OR BENT PLATE) MAY BE USED THROUGH THE RUN, BUT USE ONLY STRUCTURAL SHAPE POSTS ON THE ENDS. MAINTAIN A CONSISTENT TYPE OF POST ON ALL RUNS OF CABLE RAIL FOR THE PROJECT.



TYPICAL INSTALLATION DETAIL
INTERMEDIATE POST



TYPICAL INSTALLATION DETAIL
END POSTS

NOTES:

FOR CABLE GUARDRAIL RUNS OF:
- 162.24 m OR LESS: USE COMPENSATING ASSEMBLY ON ONE END AND TURNBUCKLE END ASSEMBLY ON THE OTHER END OF EACH CABLE.
- GREATER THAN 162.24 m, UP TO 620.96 m MAXIMUM: USE COMPENSATING END ASSEMBLY ON BOTH ENDS OF EACH CABLE.

SEE DTL. DWG. NO. 606-94 FOR TURNBUCKLE AND COMPENSATING END ASSEMBLY DETAILS.

ⓧ LINE POST SPACING:
- TANGENTS AND CURVES WITH RADII 220 m AND GREATER: 4880 mm.
- CURVES WITH RADII LESS THAN 220 m DOWN TO 70 m: 3660 mm.
- NOTE: DO NOT INSTALL CABLE GUARDRAIL ON THE INSIDE SHOULDER OF ANY CURVE.

UNIFORMLY TENSION ALL CABLES TO COMPRESS SPRINGS BY 90 mm.

DO NOT INSTALL CABLE GUARDRAIL FOR OBSTACLES WITHIN 3.7 m OF THE INSTALLATION LINE.

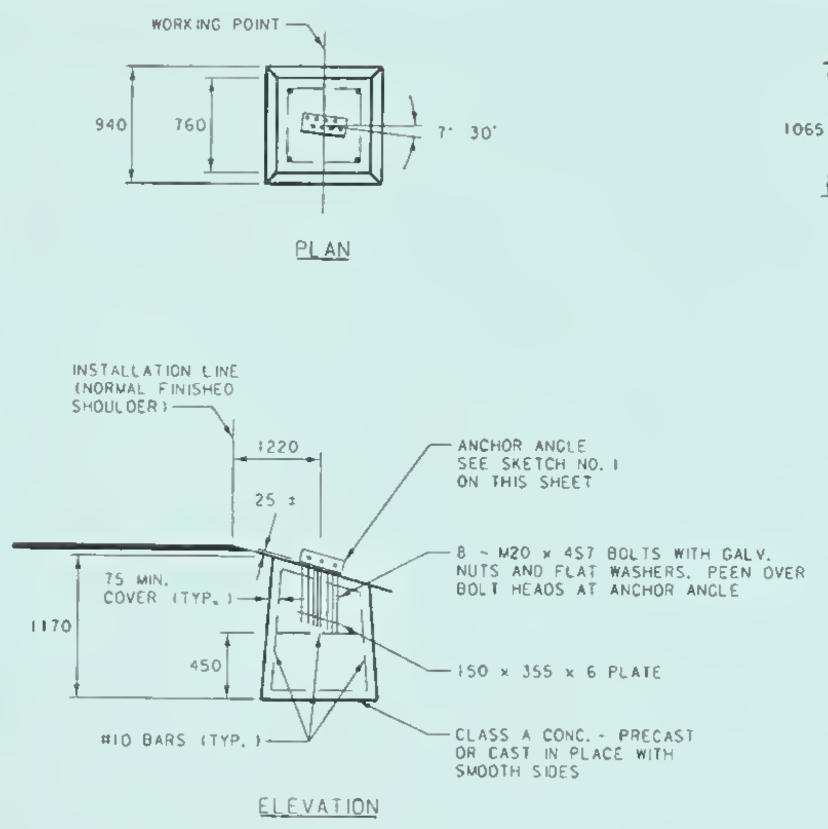
DO NOT USE CABLE GUARDRAIL WITH FILL SLOPES STEEPER THAN 2:1, UNLESS THE DISTANCE BETWEEN THE BACK OF THE POSTS AND THE BREAK IN THE FILL SLOPE IS AT LEAST 2.5 m.

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

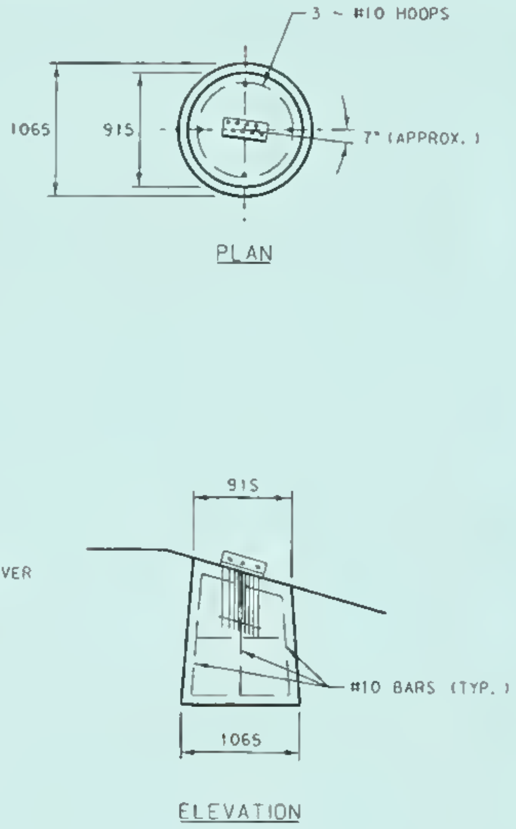
DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 606
DWG. NO.
606-40

CABLE GUARDRAIL

EFFECTIVE: AUGUST 1999
MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD


WORKING POINT
940
760
7° 30'
PLAN
INSTALLATION LINE (NORMAL FINISHED SHOULDER)
1220
25 ±
ANCHOR ANGLE SEE SKETCH NO. 1 ON THIS SHEET
8 ~ M20 × 457 BOLTS WITH GALV. NUTS AND FLAT WASHERS. PEEN OVER BOLT HEADS AT ANCHOR ANGLE
75 MIN. COVER (TYP.)
1170
450
150 × 355 × 6 PLATE
#10 BARS (TYP.)
CLASS A CONC. - PRECAST OR CAST IN PLACE WITH SMOOTH SIDES
ELEVATION

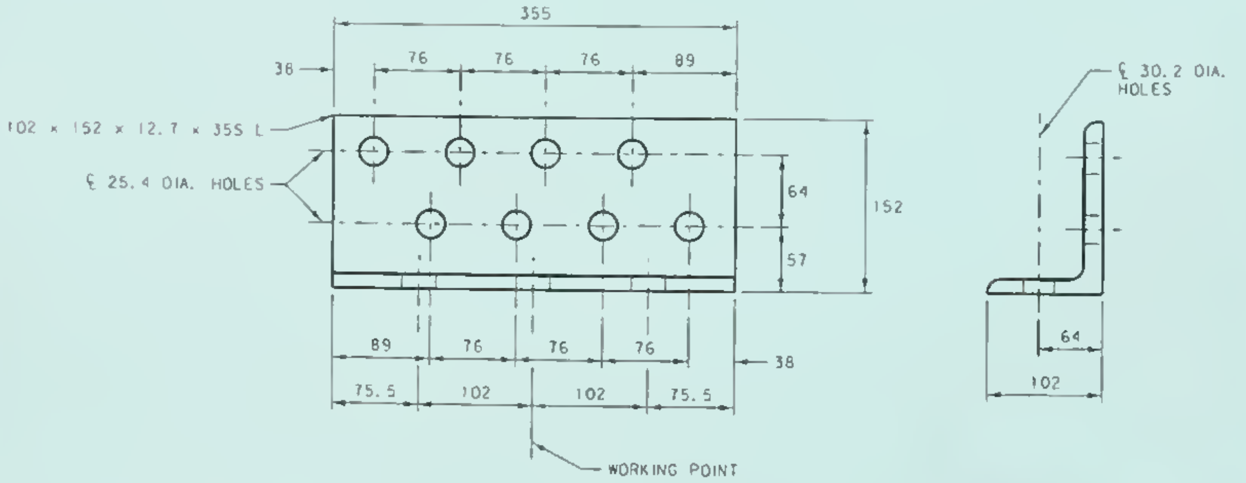
CONCRETE ANCHOR



ALTERNATE CONCRETE ANCHOR

SIMILAR EXCEPT AS NOTED

TERMINAL AND INTERMEDIATE ANCHOR SYSTEMS



SKETCH NO. 1

ANCHOR ANGLE

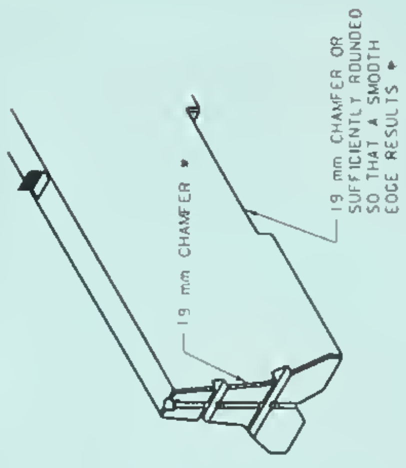
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

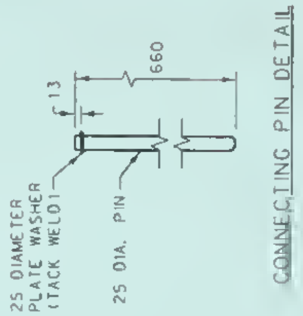
DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 606
DWG. NO.
606-41

CABLE GUARDRAIL
ANCHOR DETAILS

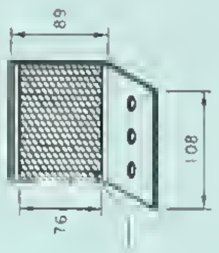
EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD


19 mm CHAMFER OR SUFFICIENTLY ROUNDED SO THAT A SMOOTH EDGE RESULTS *
19 mm CHAMFER *



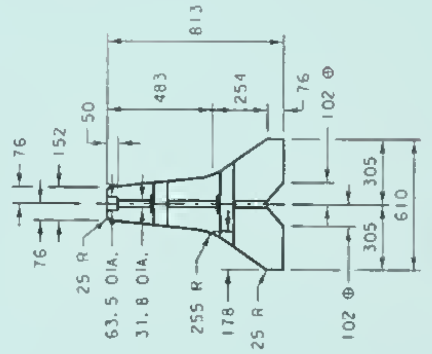
CONNECTING PIN DETAIL


89
76
108
REFLECTORIZED TYPE III (HIGH INTENSITY) SHEETING. BOTH SIDES

REFLECTOR
(SEE NOTES)

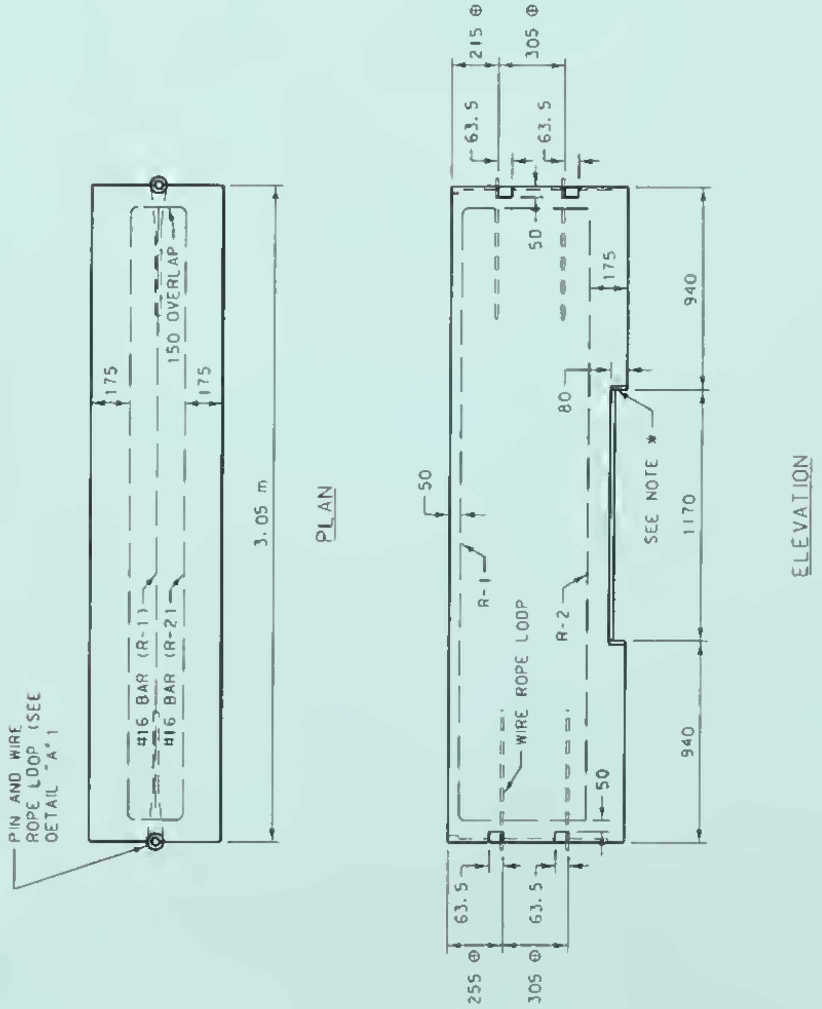
* 19 mm CHAMFER ENTIRE OPENING. 13 mm CHAMFER IS ACCEPTABLE.

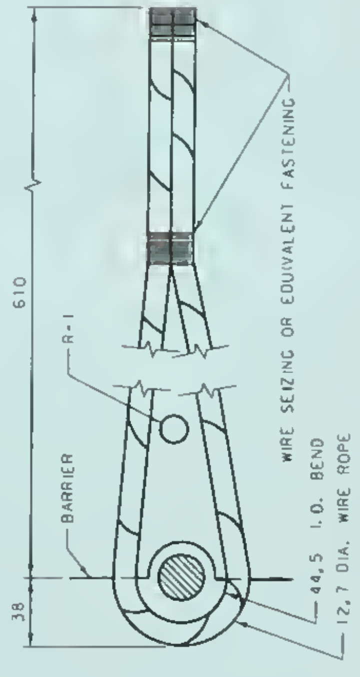
⊕ CONTRACTOR MAY VARY DIMENSIONS WITH PRIOR APPROVAL BY THE ENGINEER.



END VIEW

NORMAL SECTION





DETAIL "A"

NOTES:

USE CLASS "DD" CONCRETE OR EQUAL.

REINFORCING STEEL CONSISTS OF DEFORMED BARS CONFORMING TO AASHTO M 31M (ASTM A 615M, GRADE 420).

CONNECT EACH 3050 mm SECTION WITH A 25 mm DIA. × 660 mm PIN.

PLACE NOTCHES ON BOTH ENDS OF EACH SECTION, AS SHOWN, TO FACILITATE EASY REMOVAL.

THE CONTRACTOR IS RESPONSIBLE FOR THE PROPER FIT-UP OF THE PRECAST CONCRETE MEDIAN BARRIER RAIL. ASSEMBLE AND PIN SUFFICIENT PRECAST SECTIONS IN THE FABRICATIONS PLANT TO DETERMINE THAT PROPER FIT-UP CAN BE MAINTAINED ON ALL ROADWAY ALIGNMENT, CURVES AS WELL AS ON TANGENT. THIS IS TO BE DETERMINED EARLY IN FABRICATION.

WIRE ROPE CONSISTS OF ZINC-COATED STEEL WIRE WITH MINIMUM BREAKING STRENGTH OF 71.2 kN.

CONNECTING PIN MUST CONFORM TO AASHTO M 227M (ASTM A 663M, GRADE 310) OR BETTER AND NEED NOT BE PAINTED.

ATTACH REFLECTORS TO RAIL EVERY 9.15 METERS. FOLLOW THE MANUFACTURER'S SPECIFICATIONS FOR ADHESIVE MOUNTING.

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 554,606
DWG. NO.
606-44

CONCRETE MEDIAN
BARRIER RAIL

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

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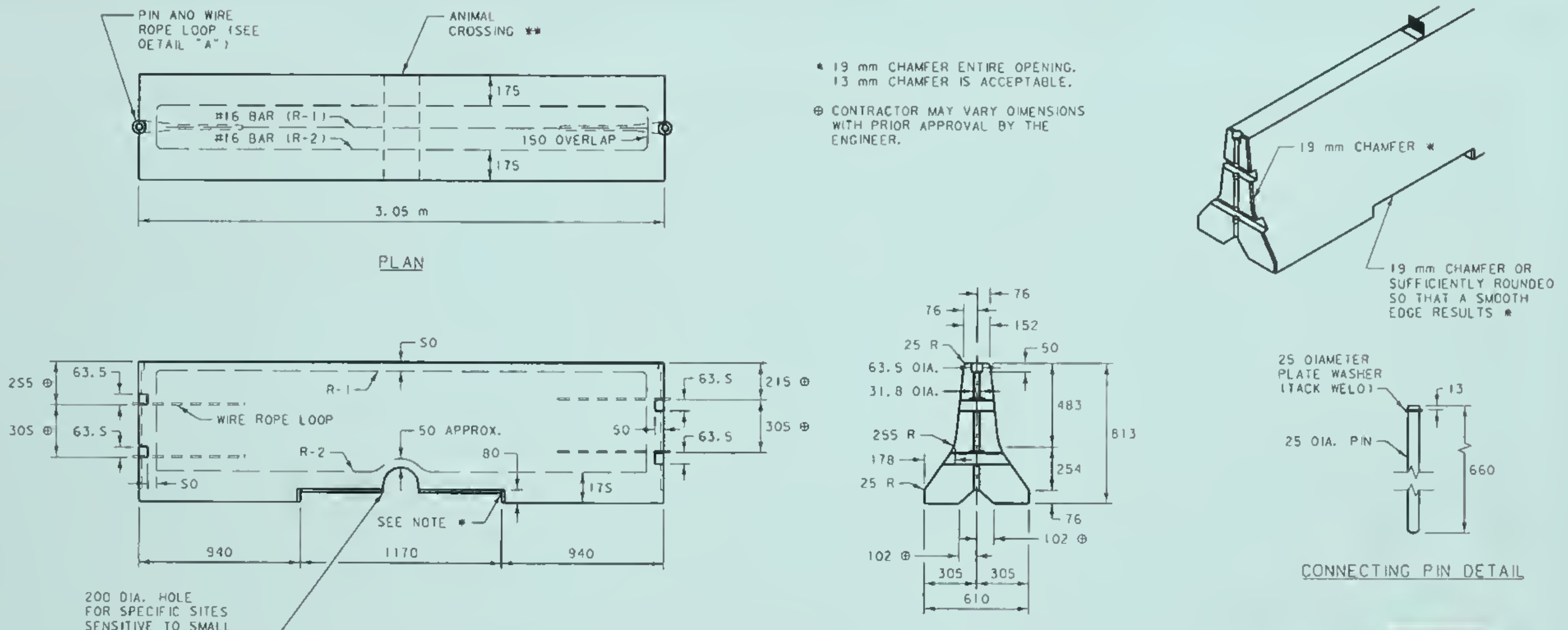


PLAN

ELEVATION

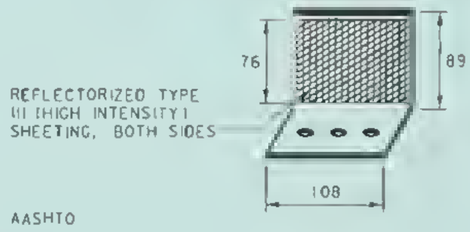
NORMAL SECTION

END VIEW

CONNECTING PIN DETAIL

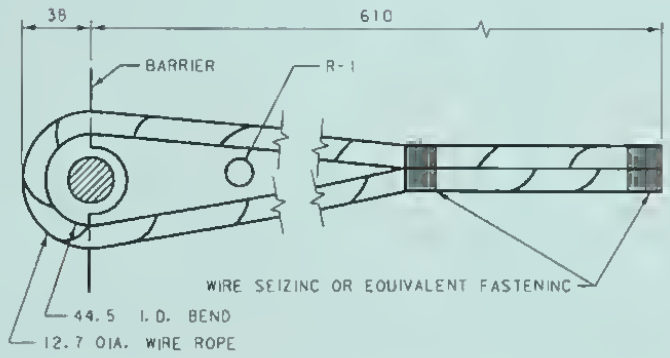
* 19 mm CHAMFER ENTIRE OPENING. 13 mm CHAMFER IS ACCEPTABLE.

⊕ CONTRACTOR MAY VARY DIMENSIONS WITH PRIOR APPROVAL BY THE ENGINEER.



REFLECTORIZED TYPE III (HIGH INTENSITY) SHEETING, BOTH SIDES
76
89
108

REFLECTOR
(SEE NOTES)



DETAIL "A"

NOTES:

USE CLASS "DD" CONCRETE OR EQUAL.

REINFORCING STEEL CONSISTS OF DEFORMED BARS CONFORMING TO AASHTO M 31M (ASTM A 615M, GRADE 420).

CONNECT EACH 3050 mm SECTION WITH A 25 mm DIA. × 660 mm PIN.

PLACE NOTCHES ON BOTH ENDS OF EACH SECTION, AS SHOWN, TO FACILITATE EASY REMOVAL.

THE CONTRACTOR IS RESPONSIBLE FOR THE PROPER FIT-UP OF THE PRECAST CONCRETE MEDIAN BARRIER RAIL. ASSEMBLE AND PIN SUFFICIENT PRECAST SECTIONS IN THE FABRICATIONS PLANT TO DETERMINE THAT PROPER FIT-UP CAN BE MAINTAINED ON ALL ROADWAY ALIGNMENT, CURVES AS WELL AS ON TANGENT. THIS IS TO BE DETERMINED EARLY IN FABRICATION.

WIRE ROPE CONSISTS OF ZINC-COATED STEEL WIRE WITH MINIMUM BREAKING STRENGTH OF 71.2 kN.

CONNECTING PIN MUST CONFORM TO AASHTO M 227M (ASTM A 663M, GRADE 310) OR BETTER AND NEED NOT BE PAINTED.

ATTACH REFLECTORS TO RAIL EVERY 9.15 METERS. FOLLOW THE MANUFACTURER'S SPECIFICATIONS FOR ADHESIVE MOUNTING.

** USE THIS RAIL ON A CASE-BY-CASE BASIS AS SPECIFIED IN THE PLANS.

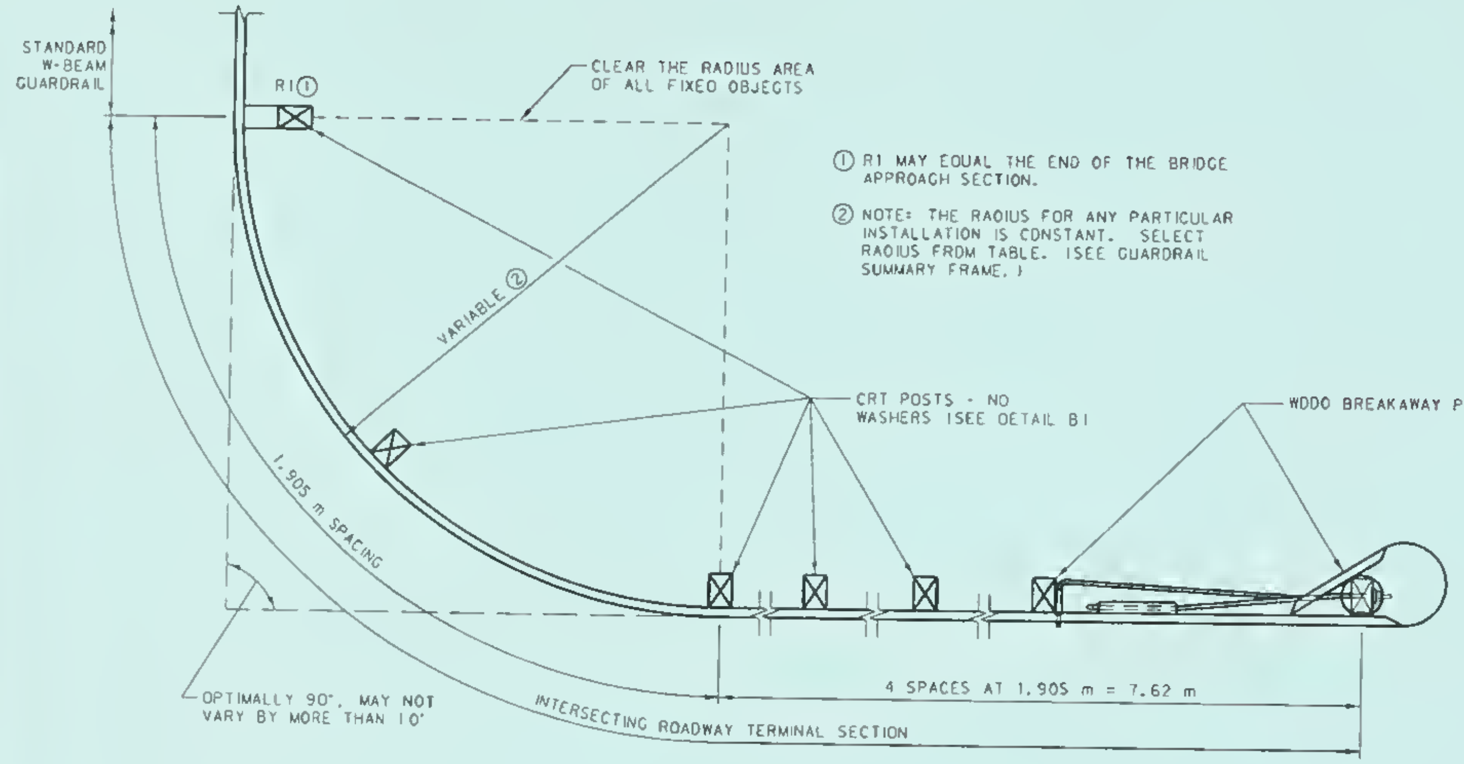
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 554, 606
DWG. NO.
606-45

ALTERNATE
CONCRETE MEDIAN
BARRIER RAIL

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD


STANDARD W-BEAM GUARDRAIL
R1 ①
CLEAR THE RADIUS AREA OF ALL FIXED OBJECTS
VARIABLE ②
CRT POSTS - NO WASHERS (SEE DETAIL B)
WOOD BREAKAWAY POSTS
1.905 m SPACING
OPTIMALLY 90°, MAY NOT VARY BY MORE THAN 10°
4 SPACES AT 1.905 m = 7.62 m
INTERSECTING ROADWAY TERMINAL SECTION

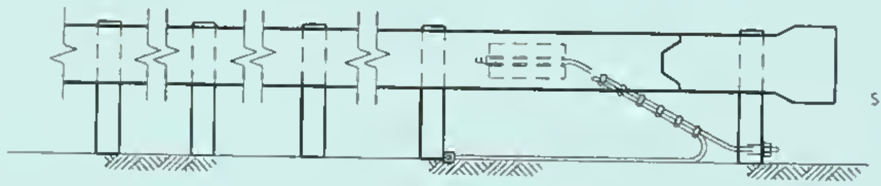
① R1 MAY EQUAL THE END OF THE BRIDGE APPROACH SECTION.

② NOTE: THE RADIUS FOR ANY PARTICULAR INSTALLATION IS CONSTANT. SELECT RADIUS FROM TABLE. (SEE GUARDRAIL SUMMARY FRAME.)

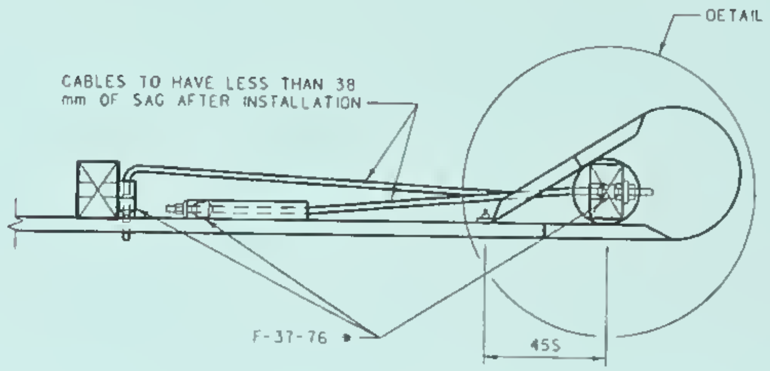
PLAN

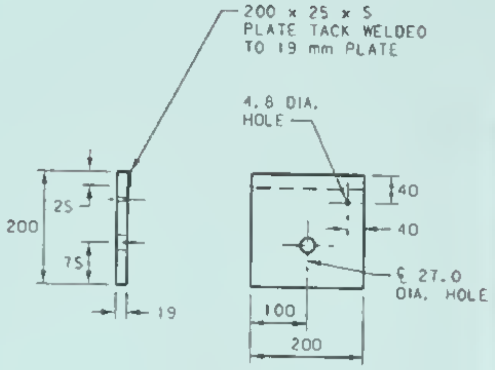
RADIUS TABLE

RADIUS	LENGTH OF BENT RAIL
2450	3.81 m
4850	7.62 m
7300	11.43 m
9700	15.24 m

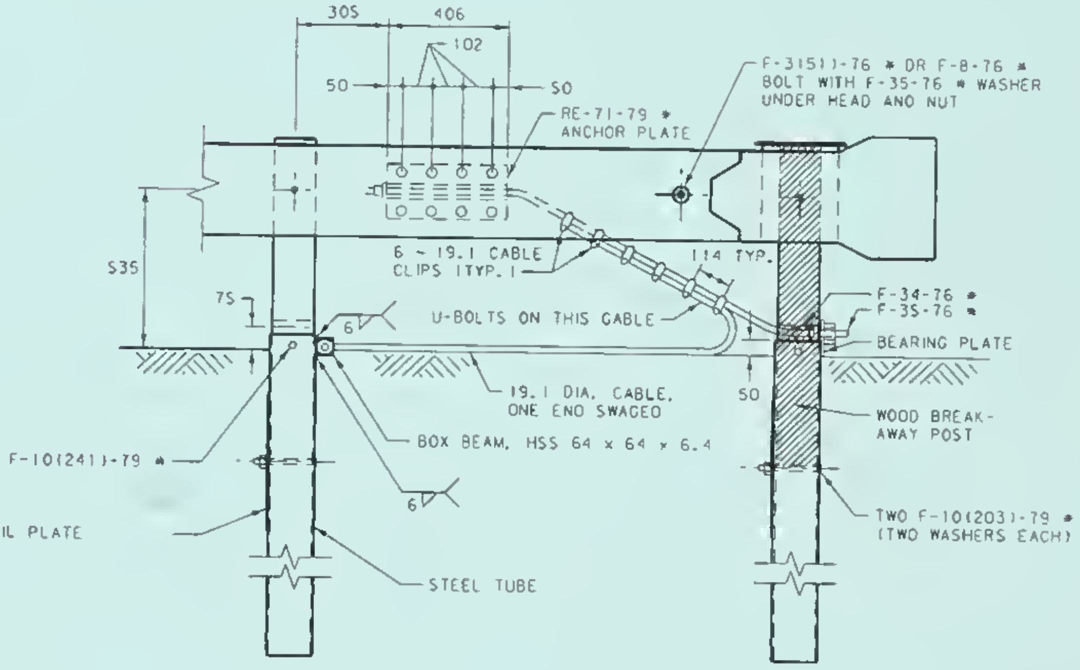


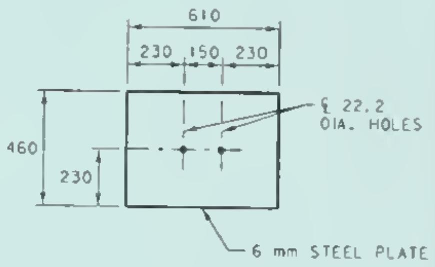
ELEVATION



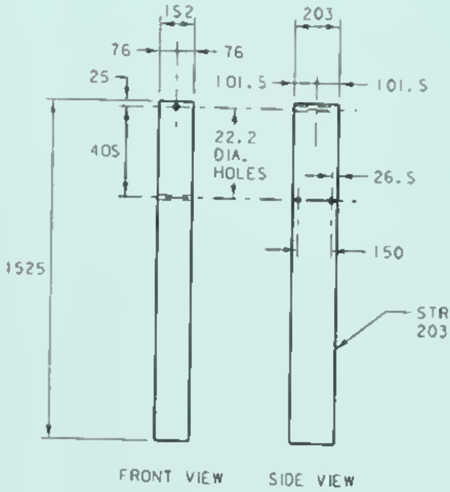


BEARING PLATE DETAIL

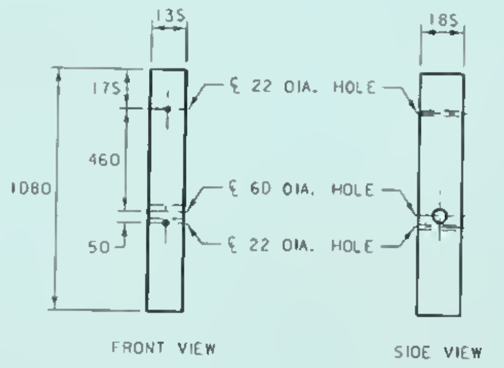

305
406
102
50
50
RE-71-79 * ANCHOR PLATE
F-3151)-76 * OR F-8-76 * BOLT WITH F-35-76 * WASHER UNDER HEAD AND NUT
535
75
6 ~ 19.1 CABLE CLIPS (TYP.)
114 TYP.
U-BOLTS ON THIS CABLE
F-34-76 *
F-35-76 *
BEARING PLATE
6
19.1 DIA. CABLE, ONE END SWAGED
50
WOOD BREAK-AWAY POST
F-10(241)-79 *
BOX BEAM, HSS 64 x 64 x 6.4
6
TWO F-10(203)-79 * (TWO WASHERS EACH)
STEEL TUBE



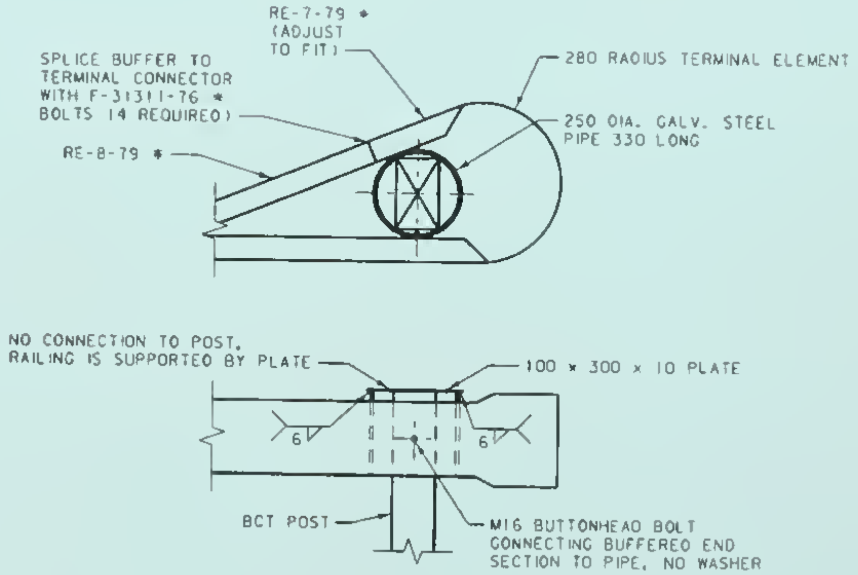
SOIL PLATE DETAIL



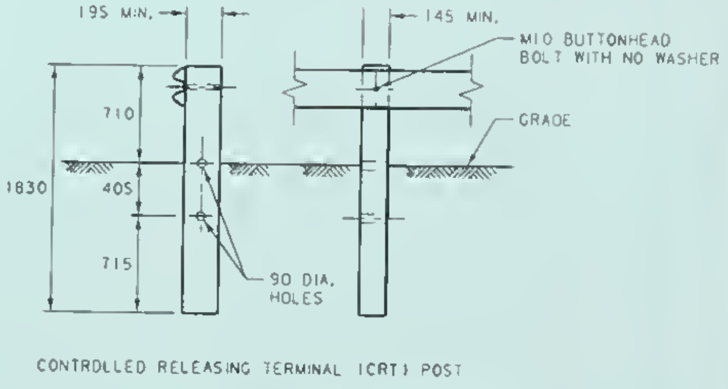
STEEL TUBE DETAILS



WOOD BREAKAWAY POST DETAILS


RE-7-79 * (ADJUST TO FIT)
SPLICE BUFFER TO TERMINAL CONNECTOR WITH F-31311-76 * BOLTS (4 REQUIRED)
280 RADIUS TERMINAL ELEMENT
250 DIA. GALV. STEEL PIPE 330 LONG
RE-8-79 *
NO CONNECTION TO POST, RAILING IS SUPPORTED BY PLATE
100 x 300 x 10 PLATE
6
6
BCT POST
M16 BUTTONHEAD BOLT CONNECTING BUFFERED END SECTION TO PIPE, NO WASHER

DETAIL A


195 MIN.
145 MIN.
M10 BUTTONHEAD BOLT WITH NO WASHER
GRADE
710
1830
405
715
90 DIA. HOLES
CONTROLLED RELEASING TERMINAL (CRT) POST

DETAIL B

NOTES:

SEE DTL. DWG. NO. 606-05 FOR GUARDRAIL WIDENING REQUIREMENTS.

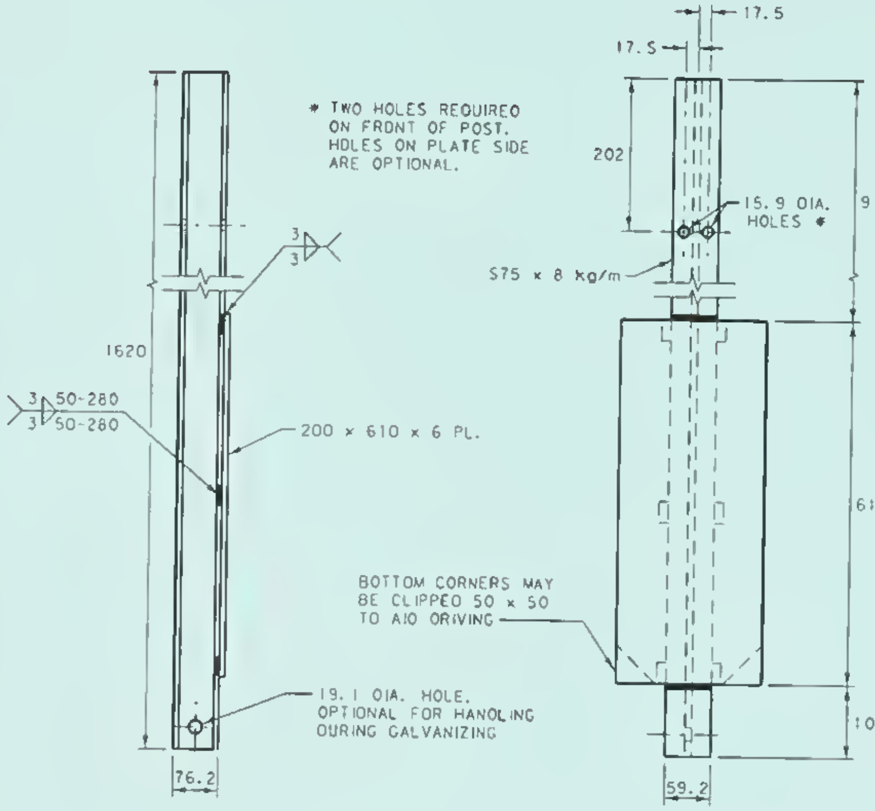
* SEE DTL. DWG. NO. 606-80 FOR SCHEDULE OF GUARDRAIL HARDWARE.

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 606
DWG. NO.
606-46

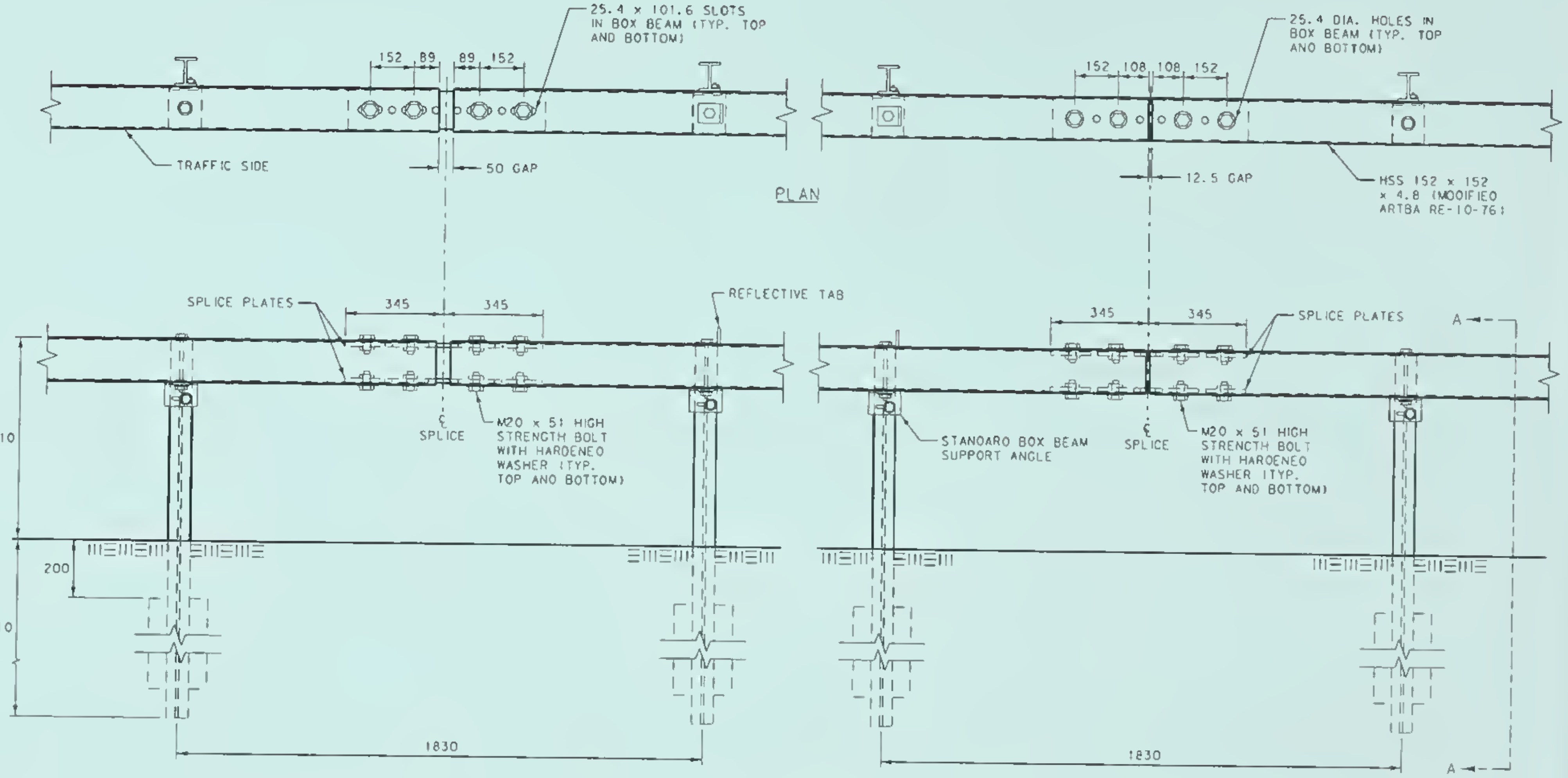
INTERSECTING ROADWAY
TERMINAL SECTION

EFFECTIVE: AUGUST 1999
MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD


17.5
17.5
* TWO HOLES REQUIRED ON FRONT OF POST. HOLES ON PLATE SIDE ARE OPTIONAL.
202
15.9 DIA. HOLES *
910
S75 × 8 kg/m
1620
3 3
3 50-280
3 50-280
200 × 610 × 6 PL.
610
BOTTOM CORNERS MAY BE CLIPPED 50 × 50 TO AID DRIVING
19.1 DIA. HOLE, OPTIONAL FOR HANDLING DURING GALVANIZING
100
76.2
59.2

STRUCTURAL SHAPE POST (STEEL)

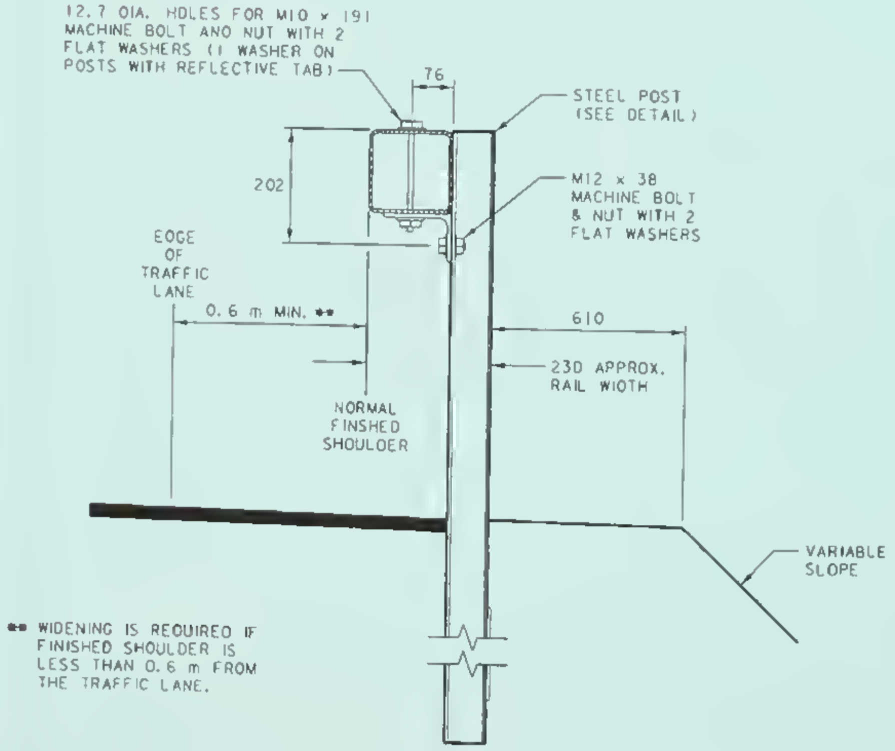
MODIFIED ARTBA P-4-76


25.4 × 101.6 SLOTS IN BOX BEAM (TYP. TOP AND BOTTOM)
152 89 89 152
TRAFFIC SIDE
50 GAP
25.4 DIA. HOLES IN BOX BEAM (TYP. TOP AND BOTTOM)
152 108 108 152
12.5 GAP
HSS 152 × 152 × 4.8 (MODIFIED ARTBA RE-10-76)
PLAN
SPLICE PLATES
345 345
REFLECTIVE TAB
710
℄ SPLICE
M20 × 51 HIGH STRENGTH BOLT WITH HARDENED WASHER (TYP. TOP AND BOTTOM)
200
910
1830
SPLICE PLATES
A
STANDARD BOX BEAM SUPPORT ANGLE
℄ SPLICE
M20 × 51 HIGH STRENGTH BOLT WITH HARDENED WASHER (TYP. TOP AND BOTTOM)
1830
A

ELEVATION

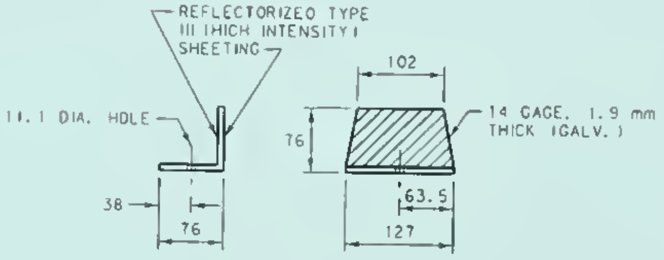
EXPANSION JOINT

SPLICE DETAIL

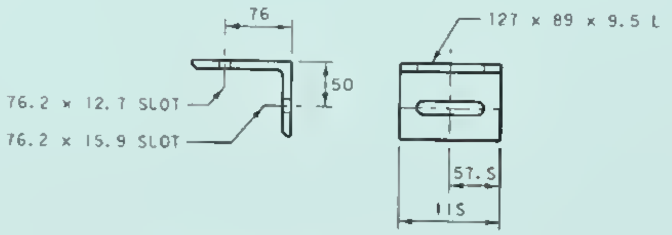

12.7 DIA. HOLES FOR M10 × 191 MACHINE BOLT AND NUT WITH 2 FLAT WASHERS (1 WASHER ON POSTS WITH REFLECTIVE TAB)
76
STEEL POST (SEE DETAIL)
202
M12 × 38 MACHINE BOLT & NUT WITH 2 FLAT WASHERS
EDGE OF TRAFFIC LANE
0.6 m MIN. **
610
230 APPROX. RAIL WIDTH
NORMAL FINISHED SHOULDER
VARIABLE SLOPE

** WIDENING IS REQUIRED IF FINISHED SHOULDER IS LESS THAN 0.6 m FROM THE TRAFFIC LANE.

SECTION A-A

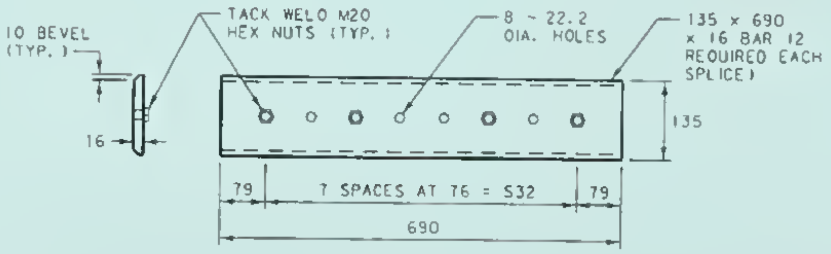

REFLECTORIZED TYPE III (HIGH INTENSITY) SHEETING
11.1 DIA. HOLE
38
76
102
76
14 GAGE, 1.9 mm THICK (GALV.)
63.5
127

REFLECTIVE TAB



STANDARD BOX BEAM SUPPORT ANGLE

MODIFIED ARTBA P-5-76


10 BEVEL (TYP.)
TACK WELD M20 HEX NUTS (TYP.)
8 ~ 22.2 DIA. HOLES
135 × 690 × 16 BAR (2 REQUIRED EACH SPLICE)
16
135
79
7 SPACES AT 76 = 532
79
690

SPLICE PLATE

MODIFIED ARTBA RE-11-73

NOTES:

USE RAIL IN MINIMUM NOMINAL LENGTHS OF 5.49 m UNLESS APPROVED BY THE ENGINEER.

INSTALL EXPANSION JOINTS ON ALL BOX BEAM INSTALLATIONS GREATER THAN 90 m IN LENGTH AT INTERVALS NOT TO EXCEED 150 m.

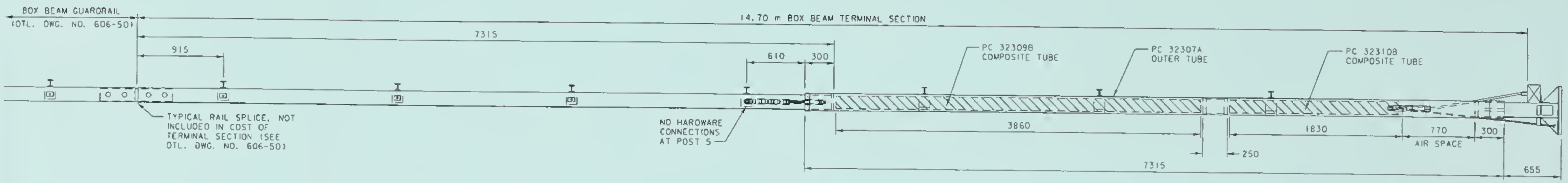
ATTACH REFLECTIVE TABS TO EVERY FOURTH POST (7.32 m TYP.).

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

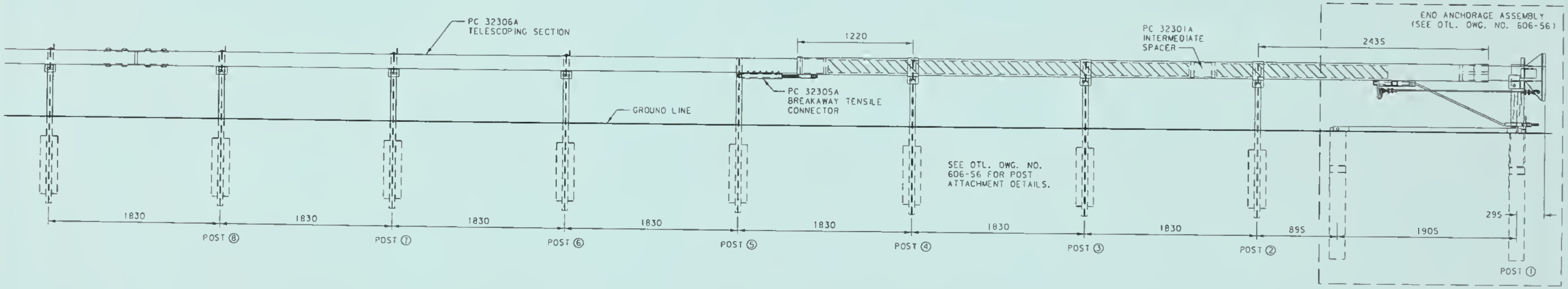
DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 606
DWG. NO.
606-50

BOX BEAM
GUARDRAIL

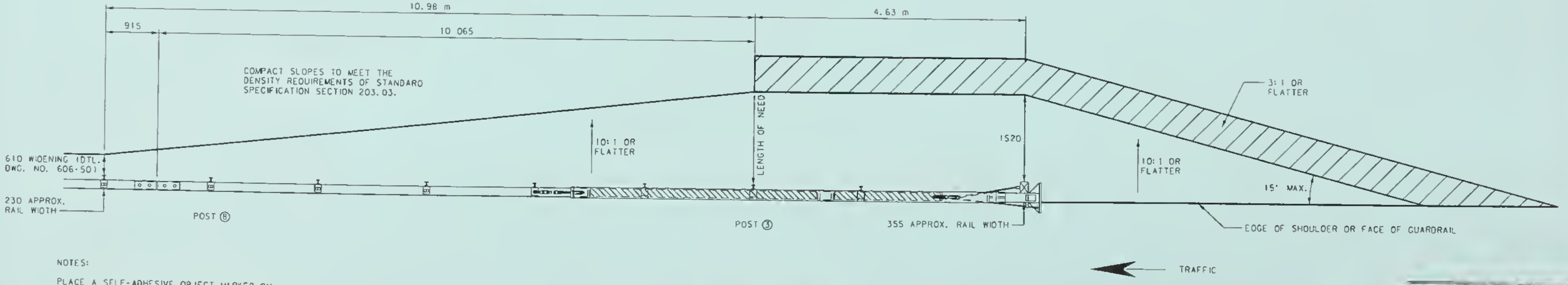
EFFECTIVE: AUGUST 1999
MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD


BOX BEAM GUARDRAIL (DTL. DWG. NO. 606-50)
14.70 m BOX BEAM TERMINAL SECTION
7315
915
610
300
PC 32309B COMPOSITE TUBE
PC 32307A OUTER TUBE
PC 32310B COMPOSITE TUBE
TYPICAL RAIL SPLICE, NOT INCLUDED IN COST OF TERMINAL SECTION (SEE DTL. DWG. NO. 606-50)
NO HARDWARE CONNECTIONS AT POST 5
3860
1830
770
300
AIR SPACE
250
7315
655

PLAN


PC 32306A TELESCOPING SECTION
1220
PC 32301A INTERMEDIATE SPACER
END ANCHORAGE ASSEMBLY (SEE DTL. DWG. NO. 606-56)
2435
PC 32305A BREAKAWAY TENSILE CONNECTOR
GROUND LINE
SEE DTL. DWG. NO. 606-56 FOR POST ATTACHMENT DETAILS.
1830
1830
1830
1830
1830
1830
1830
895
1905
295
POST ⑧
POST ⑦
POST ⑥
POST ⑤
POST ④
POST ③
POST ②
POST ①

ELEVATION


10.98 m
4.63 m
915
10 065
COMPACT SLOPES TO MEET THE DENSITY REQUIREMENTS OF STANDARD SPECIFICATION SECTION 203.03.
3:1 OR FLATTER
LENGTH OF NEED
10:1 OR FLATTER
1520
10:1 OR FLATTER
15° MAX.
610 WIDENING (DTL. DWG. NO. 606-50)
230 APPROX. RAIL WIDTH
POST ⑧
POST ③
355 APPROX. RAIL WIDTH
EDGE OF SHOULDER OR FACE OF GUARDRAIL
TRAFFIC

GUARDRAIL WIDENING

NOTES:

PLACE A SELF-ADHESIVE OBJECT MARKER ON THE FACE OF THE NOSE ASSEMBLY, HAVING ALTERNATING RETRO-REFLECTIVE BLACK AND YELLOW STRIPES SLOPED DOWNWARD AT AN ANGLE OF 45° TOWARDS THE SIDE ON WHICH TRAFFIC IS TO PASS.

DO NOT FLARE THE WY-BET TERMINAL SECTION.

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

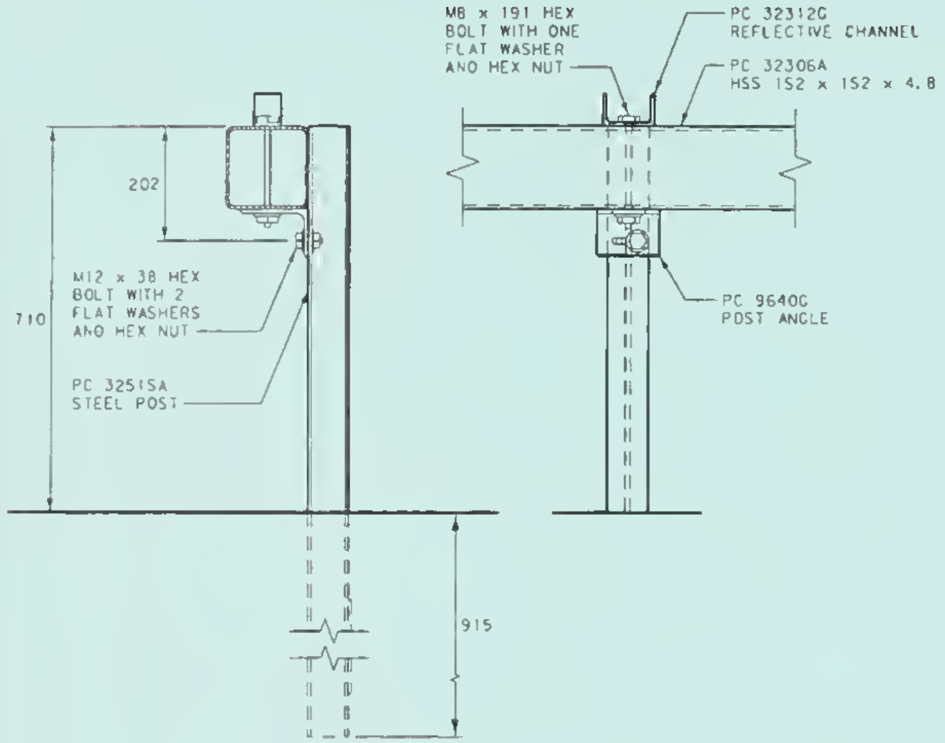
DETAILED DRAWING

REFERENCE	DWG. NO.
STANDARD SPEC. SECTION 606	606-55

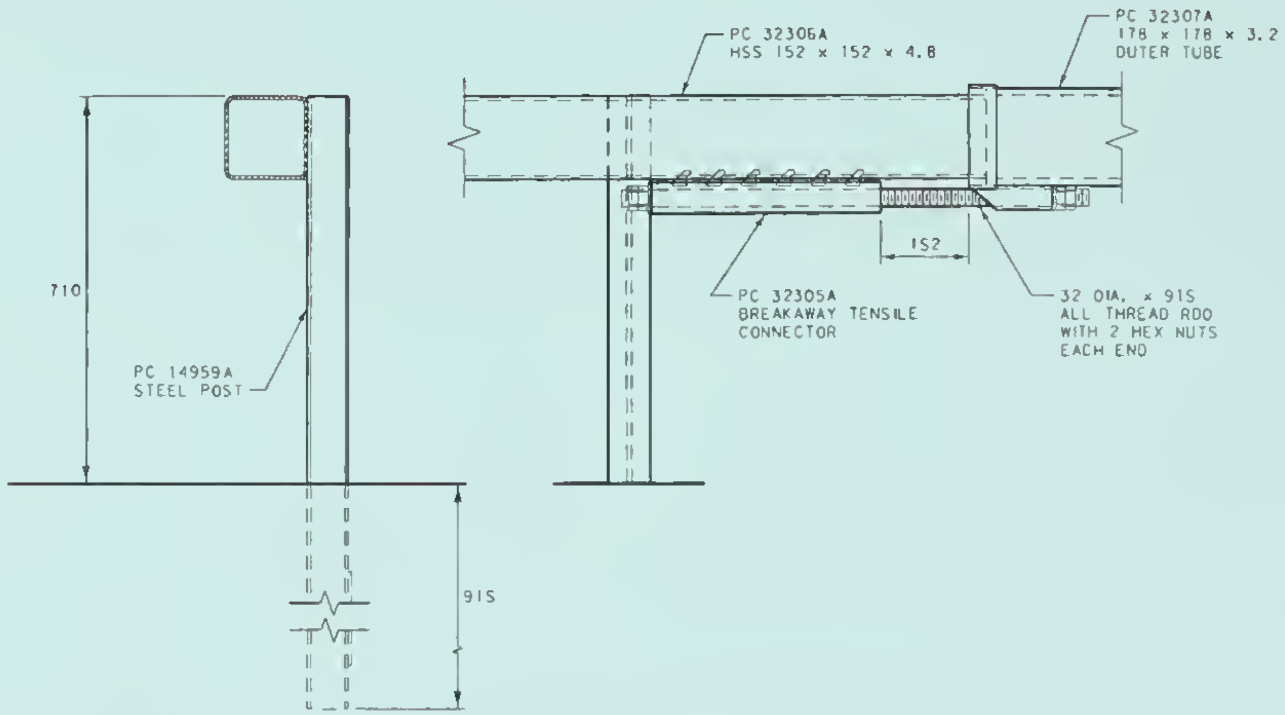
WY-BET
BOX BEAM
TERMINAL SECTION

EFFECTIVE: AUGUST 1999

MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

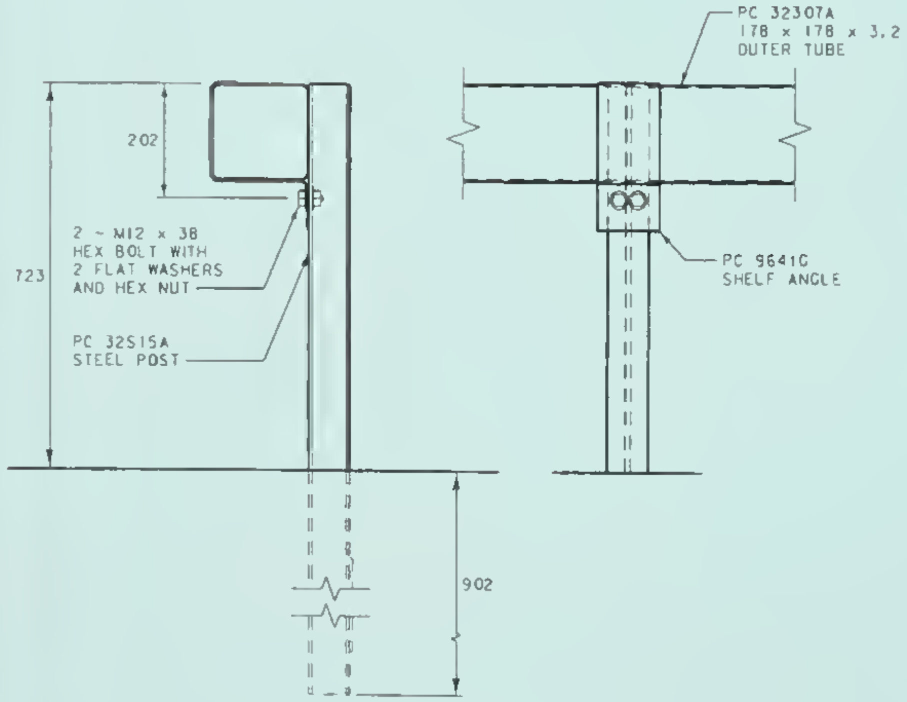

M8 x 191 HEX BOLT WITH ONE FLAT WASHER AND HEX NUT
PC 32312G REFLECTIVE CHANNEL
PC 32306A HSS 152 x 152 x 4.8
202
710
M12 x 38 HEX BOLT WITH 2 FLAT WASHERS AND HEX NUT
PC 32515A STEEL POST
PC 9640G POST ANGLE
915

POST ATTACHMENT DETAIL
(TYP. AT POSTS 6, 7 AND 8)

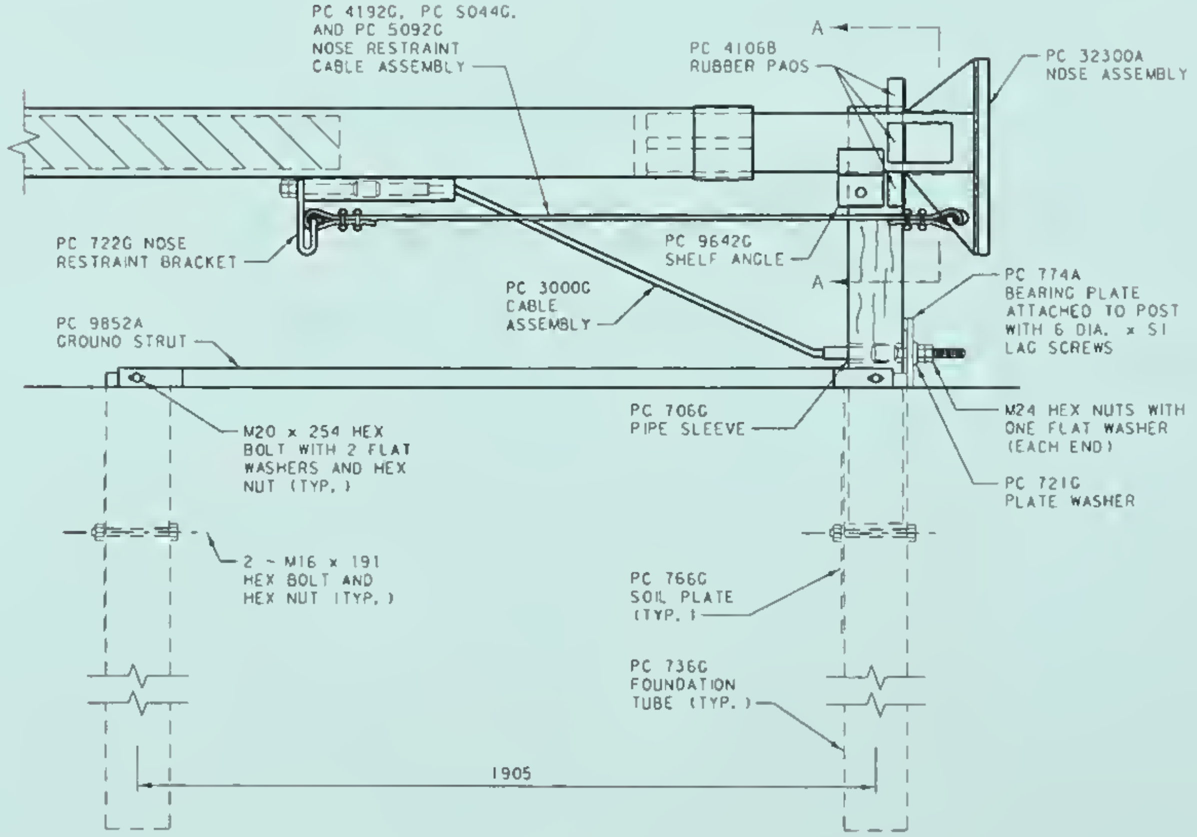

PC 32306A HSS 152 x 152 x 4.8
PC 32307A 178 x 178 x 3.2 OUTER TUBE
710
PC 14959A STEEL POST
PC 32305A BREAKAWAY TENSILE CONNECTOR
152
32 DIA. x 915 ALL THREAD ROD WITH 2 HEX NUTS EACH END
915

POST ATTACHMENT DETAIL
(POST 5)

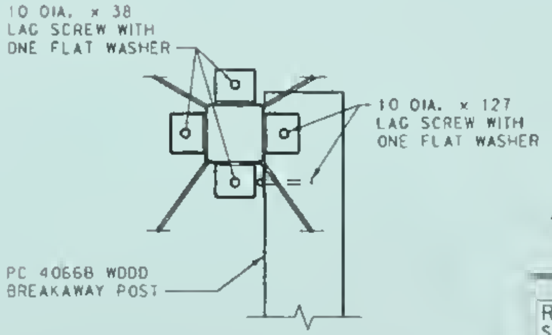
BILL OF MATERIAL		
PC	QTY	DESCRIPTION
706G	1	PIPE SLEEVE, 50 DIA. x 150
721G	1	PLATE WASHER, 75 x 100 x 10
722G	1	NOSE RESTRAINT CABLE BRACKET
736G	2	STEEL TUBE, 152 x 203 x 1525
766G	2	SOIL PLATE, 460 x 610 x 6
774A	1	SLOTTED BEARING PLATE
3000G	1	CABLE ASSEMBLY
3148G	2	6 DIA. x 51 LAG SCREW
3240G	3	M8 ROUND WASHER
3245G	3	M8 HEX NUT
3254G	3	10 DIA. x 38 LAG SCREW
3255G	5	M10 ROUND WASHER
3264G	2	10 DIA. x 127 LAG SCREW
3350G	4	M16 HEX NUT
3478G	4	M16 x 191 HEX BOLT
3700G	4	M20 ROUND WASHER
3710G	2	M20 HEX NUT
4044G	4	32 DIA. HEX NUT
4066B	1	WOOD POST, 150 x 200 x 1080
4106B	3	RUBBER PAD, 38.1 x 88.9 x 101.6
4192G	4	6.4 mm CABLE CLAMP
4300G	18	M12 ROUND WASHER
4303G	9	M12 HEX NUT
4308G	9	M12 x 38 HEX BOLT
4719G	2	M20 x 254 HEX BOLT
4902G	2	M24 ROUND WASHER
4903G	4	M24 HEX NUT
5044G	1	AIRCRAFT CABLE, 6.4 DIA. x 2080
5092G	2	6.4 mm AIRCRAFT CABLE THIMBLE
5188G	3	M8 x 191 HEX BOLT
5423G	1	32 DIA. x 915 ALL THREAD ROD
9640G	3	POST ANGLE, 127 x 89 x 9.5 x 115
9641G	3	SHELF ANGLE, 115 x 3.2 x 486
9642G	1	SHELF ANGLE, 115 x 3.2 x 283
9852A	1	STRUT AND YOKE ASSEMBLY
14959A	1	1625 mm STEEL POST
32300A	1	WY-BET NOSE ASSEMBLY
32301A	1	HSS 152 x 152 x 250 INTERMEDIATE SPACER
32305A	1	BREAKAWAY TENSILE CONNECTOR
32306A	1	HSS 152 x 152 x 4.8 TELESCOPING SECTION
32307A	1	OUTER TUBE
32309B	1	152.4 O.D. x 6.4 x 3860 COMPOSITE TUBE
32310B	1	152.4 O.D. x 3.2 x 1830 COMPOSITE TUBE
32312G	3	REFLECTOR CHANNEL
32515A	6	1625 mm STEEL POST


PC 32307A 178 x 178 x 3.2 OUTER TUBE
202
723
2 ~ M12 x 38 HEX BOLT WITH 2 FLAT WASHERS AND HEX NUT
PC 32515A STEEL POST
PC 9641G SHELF ANGLE
902

POST ATTACHMENT DETAIL
(TYP. AT POSTS 2, 3 AND 4)


PC 4192G, PC 5044G, AND PC 5092G NOSE RESTRAINT CABLE ASSEMBLY
PC 4106B RUBBER PADS
A
PC 32300A NOSE ASSEMBLY
PC 722G NOSE RESTRAINT BRACKET
PC 9642G SHELF ANGLE
PC 3000G CABLE ASSEMBLY
PC 774A BEARING PLATE ATTACHED TO POST WITH 6 DIA. x 51 LAG SCREWS
PC 9852A GROUND STRUT
M20 x 254 HEX BOLT WITH 2 FLAT WASHERS AND HEX NUT (TYP.)
PC 706G PIPE SLEEVE
M24 HEX NUTS WITH ONE FLAT WASHER (EACH END)
PC 721G PLATE WASHER
2 ~ M16 x 191 HEX BOLT AND HEX NUT (TYP.)
PC 766G SOIL PLATE (TYP.)
PC 736G FOUNDATION TUBE (TYP.)
1905

END ANCHORAGE ASSEMBLY


10 DIA. x 38 LAG SCREW WITH ONE FLAT WASHER
10 DIA. x 127 LAG SCREW WITH ONE FLAT WASHER
PC 4066B WOOD BREAKAWAY POST

SECTION A-A

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 606
DWG. NO.
606-56

WY-BET BOX
BEAM TERMINAL
SECTION DETAILS

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

SCHEDULE OF HARDWARE *

DESIGNATION	DESCRIPTION	DTL. DWG. NO.
F-1-76	M8 HOOK BOLTS	606-82
F-3( )-76	M16 BUTTONHEAD BOLT AND NUT	606-82
F-8-76	M16 HEX BOLT AND NUT	606-82
F-10( )-79	M20 HEX BOLT AND NUT	606-82
F-12-73	RECTANGULAR PLATE WASHER	606-84
F-13-73	STEEL WASHER FOR M16 BOLT	606-84
F-34-76	PIPE SLEEVE	606-84
F-35-76	STEEL WASHER AND NUT FOR M24 BOLT	606-84
F-37-76	CABLE ASSEMBLY	606-86
F-38-79	END PLATE	606-84
P-1-76	STRUCTURAL SHAPE LINE POST (STEEL)	606-92
P-2-79	END POST FITTINGS	606-90
P-46-76	BENT PLATE LINE POST (STEEL)	606-92
RE-1-76	19.1 DIA. WIRE ROPE (3 x 7)	606-94
RE-3-73	W-BEAM	606-88
RE-5-76	W-BEAM END SECTION (FLARED)	606-88
RE-7(610)-79	W-BEAM END SECTION (BUFFER)	606-88
RE-8-79	W-BEAM TERMINAL CONNECTOR	606-88
RE-71-79	ANCHOR PLATE	606-86

* SEE ARTBA TECHNICAL BULLETIN NO. 268-B (AGC STANDARD FORM NO. 131) "A GUIDE TO STANDARDIZED HIGHWAY BARRIER RAIL HARDWARE."

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

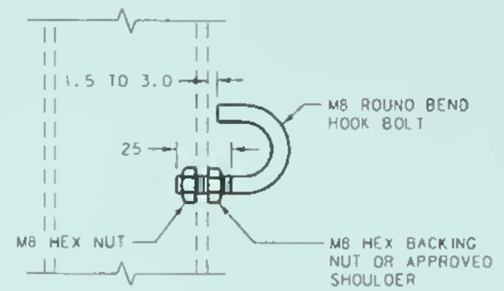
DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 606
DWG. NO.
606-80

SCHEDULE OF
GUARDRAIL HARDWARE

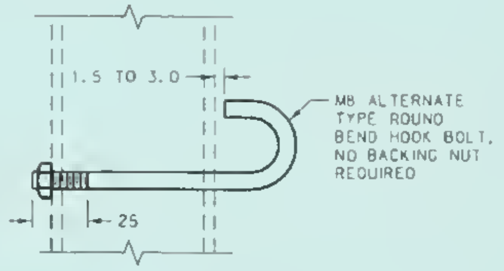
EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

NOTE:
NUTS ARE OF THE HEAVY HEX TYPES. INSTALL BOLTS TO DEVELOP AN ULTIMATE PULL OPEN STRENGTH FROM 2225 N TO 4450 N APPLIED IN A DIRECTION NORMAL TO THE LONGITUDINAL AXIS OF THE POST.

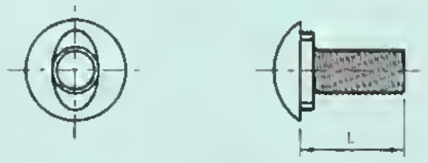


M8 HOOK BOLT


1.5 TO 3.0
M8 ALTERNATE TYPE ROUND BEND HOOK BOLT, NO BACKING NUT REQUIRED
25

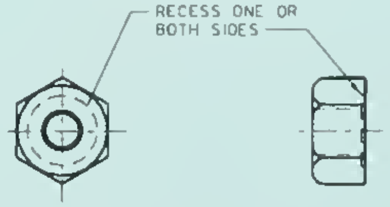
ALTERNATE M8 HOOK BOLT

F-1-76



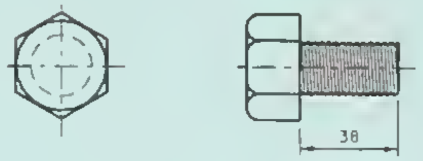
M16 OVAL SHOULDERED BUTTONHEAD BOLT

L	THREAD LENGTH
31	FULL
51	38 MIN.
241	44 MIN.
457	63 MIN.
635	51 MIN.

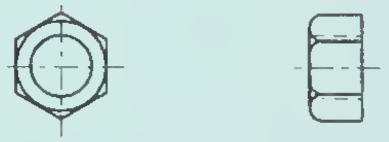


M16 RECESS NUT

F-3( )-76

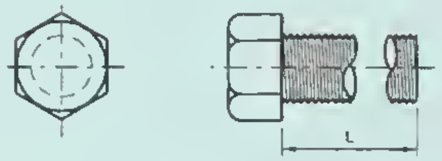


M16 HEX BOLT



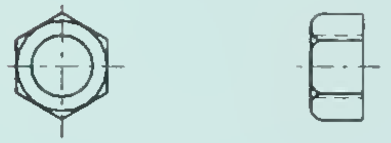
M16 HEX NUT

F-8-76

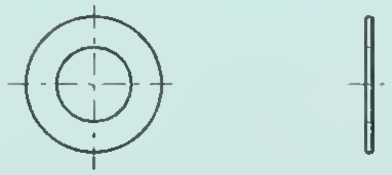


M20 HEX BOLT

L	THREAD LENGTH
38	FULL
114	51
191	51
241	51



M20 HEX NUT



STEEL WASHER FOR M20 BOLT

F-10( )-79

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

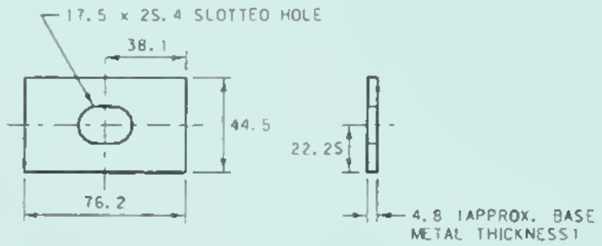
DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 606
DWG. NO.
606-82

GUARDRAIL HARDWARE

EFFECTIVE: AUGUST 1999

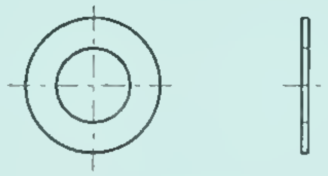
MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

NOTE:
CONFORM WASHER TO THE REQUIREMENTS OF AASHTO M 180.



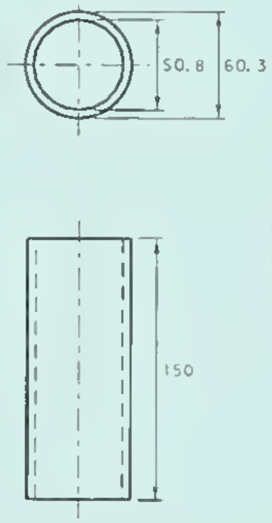
RECTANGULAR PLATE WASHER

F-12-73



STEEL WASHER FOR M16 BOLT

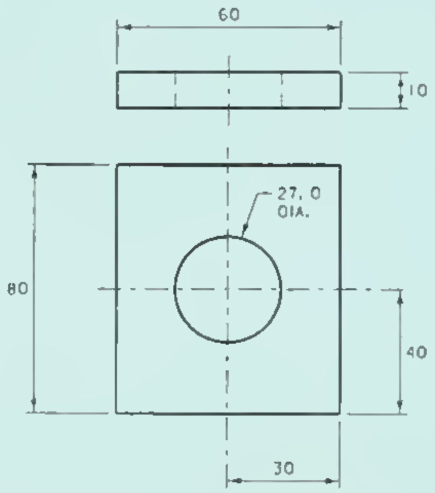
F-13-73



NOTE:
SLEEVE CONSISTS OF 50 mm GALVANIZED STANDARD PIPE, CONFORMING TO THE REQUIREMENTS OF ASTM A 53.

POST SLEEVE

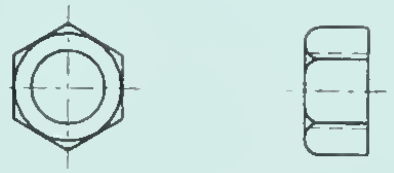
F-34-76



NOTE:
END PLATES ARE TO CONFORM TO THE REQUIREMENTS OF ASTM A 36M AND BE GALVANIZED IN ACCORDANCE WITH AASHTO M 111 (ASTM A 123M).

END PLATE

F-38-79

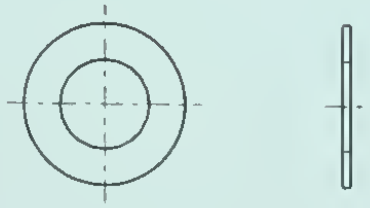


M24 HEX NUT

NOTE:

NUTS ARE TO CONFORM TO THE REQUIREMENTS OF ASTM A 325M AND WASHERS ARE TO BE MADE OF STEEL; GALVANIZE BOTH IN ACCORDANCE WITH AASHTO M 232M (ASTM A 153M). AFTER GALVANIZING, THE PITCH DIAMETER OF THE NUT MAY BE TAPPED 0.6 mm OVER THE ANSI CLASS 2B TOLERANCE.

WASHERS ARE TO MEET THE DIMENSIONAL REQUIREMENTS OF ANSI B27.2 TYPE A PLAIN WASHERS. NO PUNCHING, DRILLING OR CUTTING IS PERMITTED AFTER GALVANIZING.



STEEL WASHER FOR M24 BOLT

F-35-76

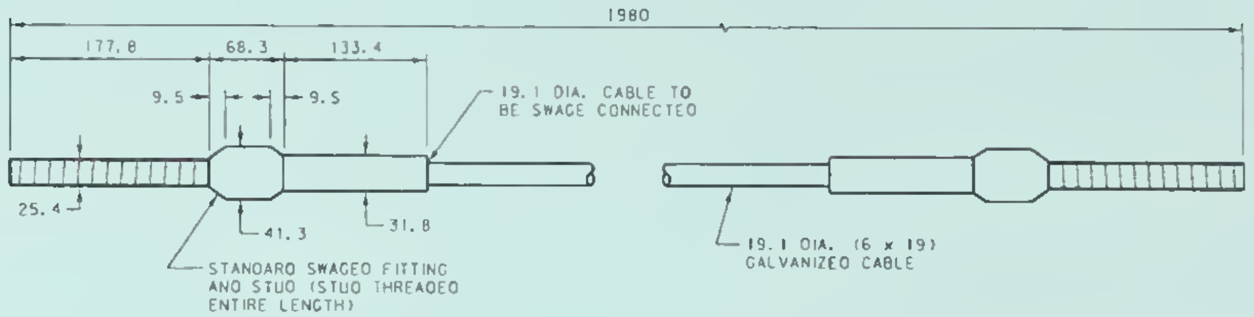
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 606
DWG. NO.
606-84

GUARDRAIL HARDWARE

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD


1980
177.8
68.3
133.4
9.5
9.5
19.1 DIA. CABLE TO BE SWAGE CONNECTED
25.4
41.3
31.8
STANDARD SWAGED FITTING AND STUD (STUD THREADED ENTIRE LENGTH)
19.1 DIA. (6 x 19) GALVANIZED CABLE

NOTES:

FOR RELATED FASTENER HARDWARE SEE F-35-76 AND F-38-79.

MACHINE THE SWAGED FITTING FROM HOT-ROLLED CARBON STEEL, CONFORMING TO THE REQUIREMENTS OF ASTM A 576, GRADE 1035, AND ANNEAL SUITABLE FOR COLD SWAGING. GALVANIZE THE SWAGED FITTING IN ACCORDANCE WITH ASTM A 123M BEFORE SWAGING. DRILL A LOCK PIN HOLE TO ACCOMMODATE A 6.4 mm, PLATED SPRING STEEL PIN THROUGH THE HEAD OF THE SWAGED FITTING TO RETAIN THE STUD IN THE PROPER POSITION. AFTER GALVANIZING THE HEAD MAY BE TAPPED 0.6 mm OVER THE ANSI CLASS 2B TOLERANCE.

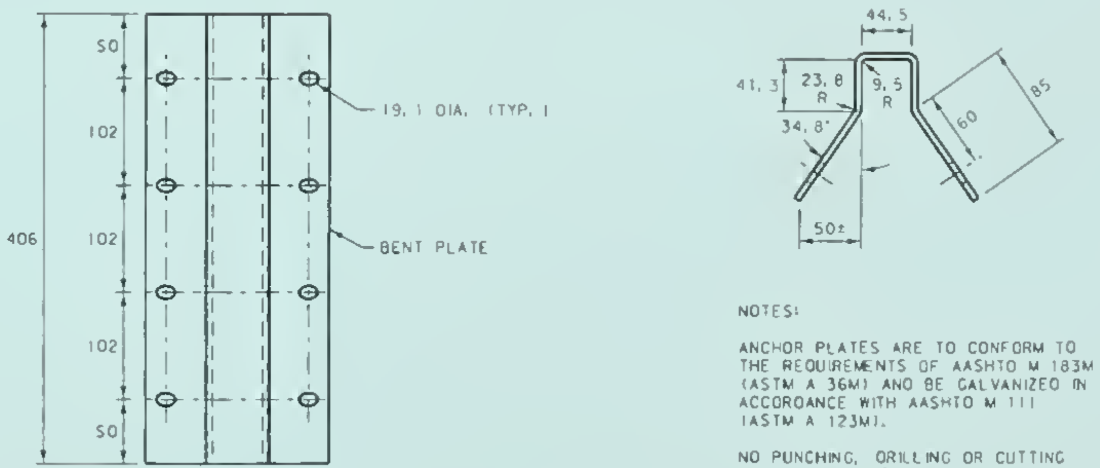
THE STUD IS TO CONFORM TO THE REQUIREMENTS OF ASTM A 449 AND BE GALVANIZED IN ACCORDANCE WITH ASTM A 153M. THE THREADS MUST HAVE A CLASS 2A FIT BEFORE GALVANIZING. PRIOR TO GALVANIZING, MILL A 9.5 mm SLOT INTO THE STUD END FOR THE LOCKING PIN.

WIRE ROPE IS TO CONFORM TO THE REQUIREMENTS OF AASHTO M 30 AND BE 19.1 mm PREFORMED, 6 x 19, WIRE STRAND CORE OR INDEPENDENT WIRE ROPE CORE (IWRC), GALVANIZED, RIGHT REGULAR LAY, MANUFACTURED OF IMPROVED PLOW STEEL WITH A MINIMUM BREAKING STRENGTH OF 190.4 kN.

THE SWAGED FITTING, STUD AND NUT (F-35-76) MUST DEVELOP THE BREAKING STRENGTH OF THE WIRE ROPE.

CABLE ASSEMBLY

F-37-76



NOTES:

ANCHOR PLATES ARE TO CONFORM TO THE REQUIREMENTS OF AASHTO M 183M (ASTM A 36M) AND BE GALVANIZED IN ACCORDANCE WITH AASHTO M 111 (ASTM A 123M).

NO PUNCHING, DRILLING OR CUTTING IS PERMITTED AFTER GALVANIZING.

ANCHOR PLATE

RE-71-79

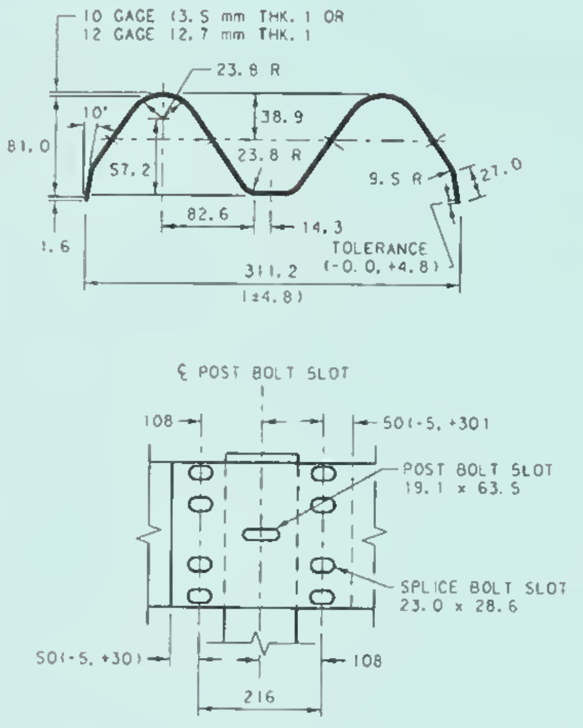
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 606
DWG. NO.
606-86

GUARDRAIL HARDWARE

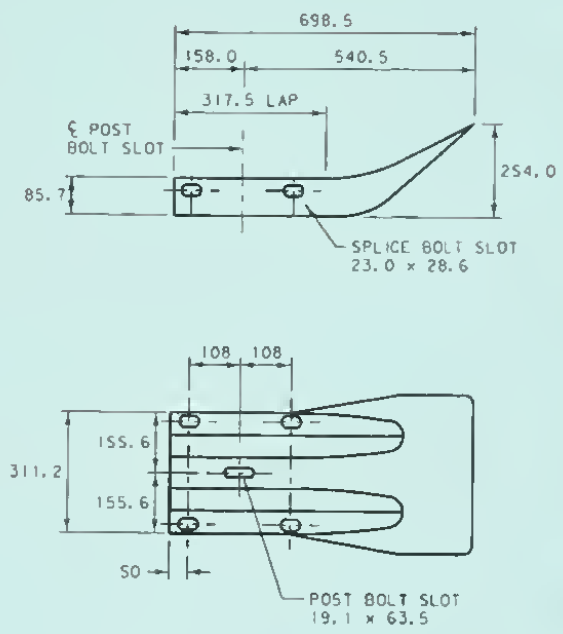
EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



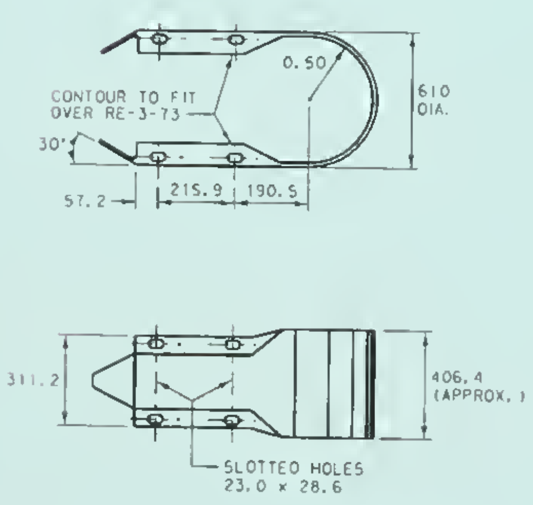
W-BEAM

RE-3-73



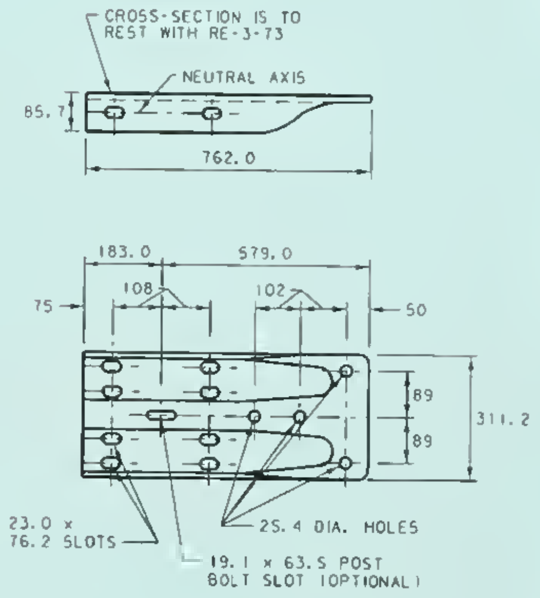
W-BEAM END SECTION (FLARED)

RE-5-76



W-BEAM END SECTION (BUFFER)

RE-7(610)-79



W-BEAM TERMINAL CONNECTOR

RE-8-79

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

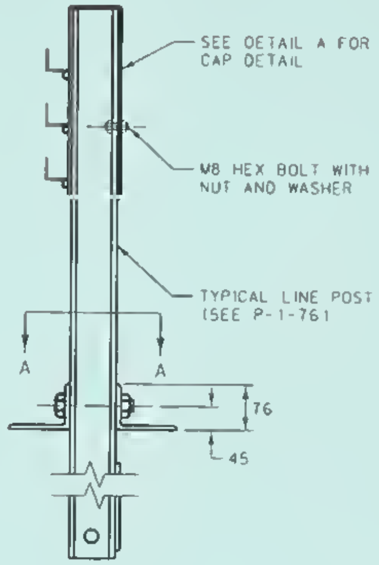
DETAILED DRAWING

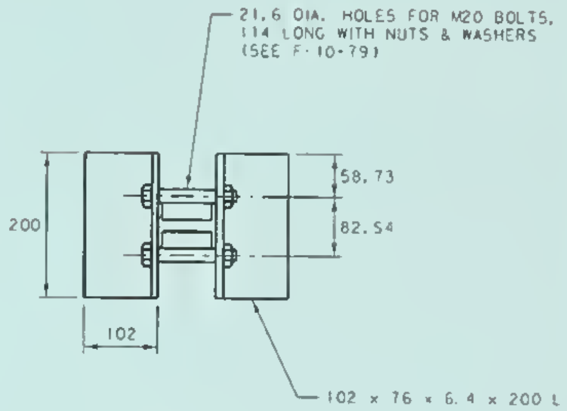
REFERENCE STANDARD SPEC. SECTION 606	DWG. NO. 606-88

GUARDRAIL HARDWARE

EFFECTIVE: AUGUST 1999

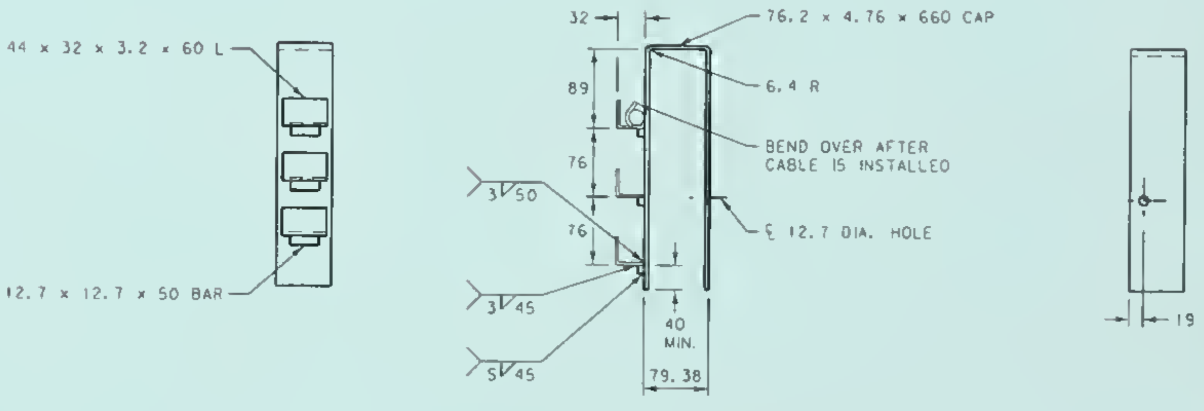
MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD


SEE DETAIL A FOR CAP DETAIL
M8 HEX BOLT WITH NUT AND WASHER
TYPICAL LINE POST (SEE P-1-76)
A
A
76
45


21.6 DIA. HOLES FOR M20 BOLTS, 114 LONG WITH NUTS & WASHERS (SEE F-10-79)
58.73
82.54
200
102
102 x 76 x 6.4 x 200 L

SECTION A-A

FITTINGS ON END POST



DETAIL A

END POST FITTINGS

P-2-79

NOTES:

ANGLES AND PLATES ARE TO CONFORM TO AASHTO M 183M (ASTM A 36M) AND BE GALVANIZED IN ACCORDANCE WITH AASHTO M 111 (ASTM A 123M).

BOLTS AND NUTS ARE TO CONFORM TO THE REQUIREMENTS OF ASTM A 307 AND A 563M, CLASS A OR BETTER, RESPECTIVELY. WASHERS ARE MADE OF STEEL, MEETING THE DIMENSIONAL REQUIREMENTS OF ANSI B27.2 TYPE A NARROW WASHER. GALVANIZE BOLTS, NUTS AND WASHERS IN ACCORDANCE WITH ASTM A 153M.

WELDING IS TO CONFORM TO THE CURRENT REQUIREMENTS OF THE AMERICAN WELDING SOCIETY STRUCTURAL WELDING CODE, A.W.S. D1.1.

NO PUNCHING, DRILLING, CUTTING OR WELDING IS PERMITTED AFTER GALVANIZING.

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

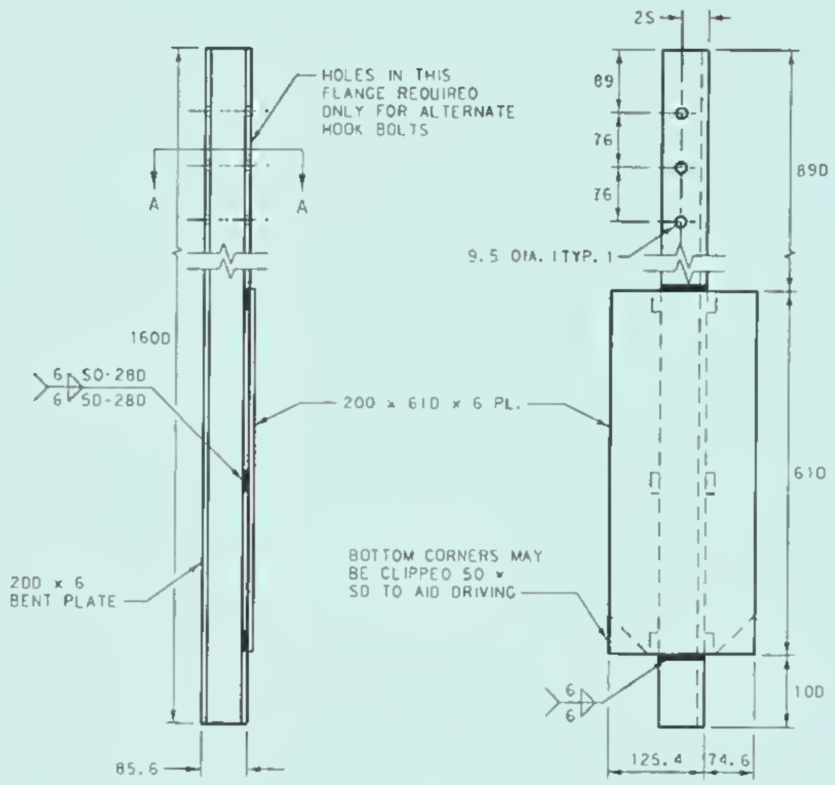
DETAILED DRAWING

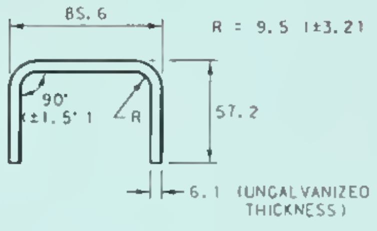
REFERENCE STANDARD SPEC. SECTION 606	DWG. NO. 606-90

CABLE GUARDRAIL HARDWARE

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD


25
89
76
76
890
HOLES IN THIS FLANGE REQUIRED ONLY FOR ALTERNATE HOOK BOLTS
A
A
9.5 DIA. (TYP.)
1600
6 50-280
6 50-280
200 x 610 x 6 PL.
610
BOTTOM CORNERS MAY BE CLIPPED 50 x 50 TO AID DRIVING
200 x 6 BENT PLATE
6
6
100
125.4
74.6
85.6



SECTION A-A

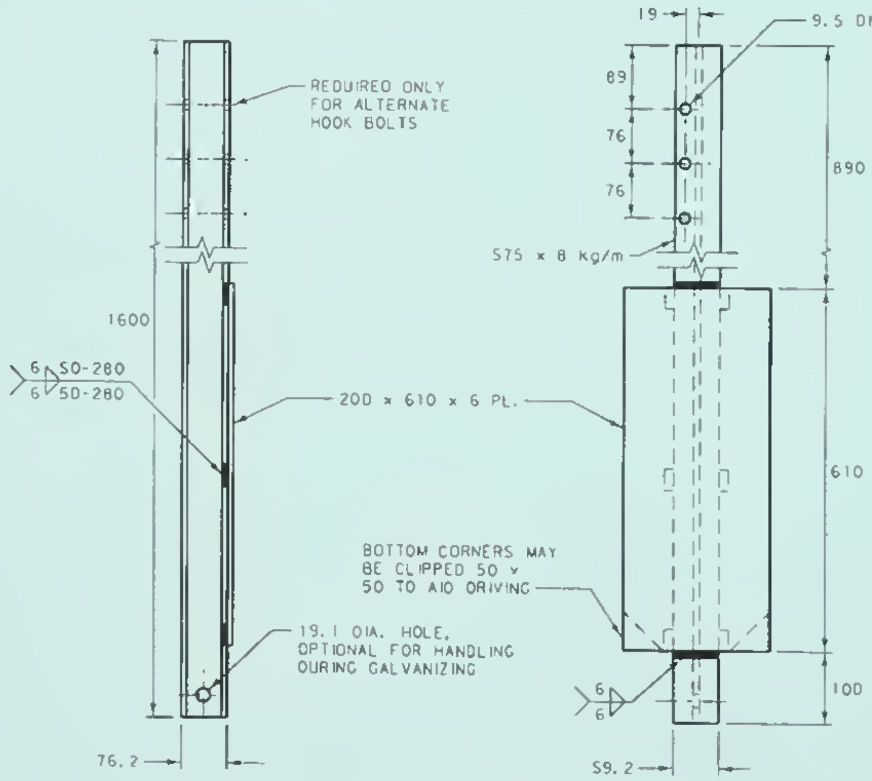
NOTES:

POSTS AND POST PLATES ARE TO CONFORM TO THE MECHANICAL REQUIREMENTS OF AASHTO M 183M (ASTM A 36M) AND BE WELDED TO MEET THE CURRENT REQUIREMENTS OF THE AMERICAN WELDING SOCIETY STRUCTURAL WELDING CODE, A.W.S. D1.1. GALVANIZE FABRICATED POSTS IN ACCORDANCE WITH AASHTO M 111 (ASTM A 123M).

NO PUNCHING, DRILLING, CUTTING OR WELDING IS PERMITTED AFTER GALVANIZING.

BENT PLATE LINE POST (STEEL)

P-46-76


19
9.5 DIA. (TYP.)
89
76
76
890
REQUIRED ONLY FOR ALTERNATE HOOK BOLTS
575 x 8 kg/m
1600
6 50-280
6 50-280
200 x 610 x 6 PL.
610
BOTTOM CORNERS MAY BE CLIPPED 50 x 50 TO AID DRIVING
19.1 DIA. HOLE, OPTIONAL FOR HANDLING DURING GALVANIZING
6
6
100
76.2
59.2

NOTES:

ALL HOLES ARE 9.5 mm EXCEPT AS NOTED.

WELDING IS TO CONFORM TO THE REQUIREMENTS OF THE CURRENT AMERICAN WELDING SOCIETY STRUCTURAL WELDING CODE, A.W.S. D1.1.

NO PUNCHING, DRILLING, CUTTING OR WELDING IS PERMITTED AFTER GALVANIZING.

POSTS AND POST PLATES ARE TO CONFORM TO AASHTO M 183M (ASTM A 36M) AND BE GALVANIZED IN ACCORDANCE WITH AASHTO M 111 (ASTM A 123M).

STRUCTURAL SHAPE LINE POST (STEEL)

P-1-76

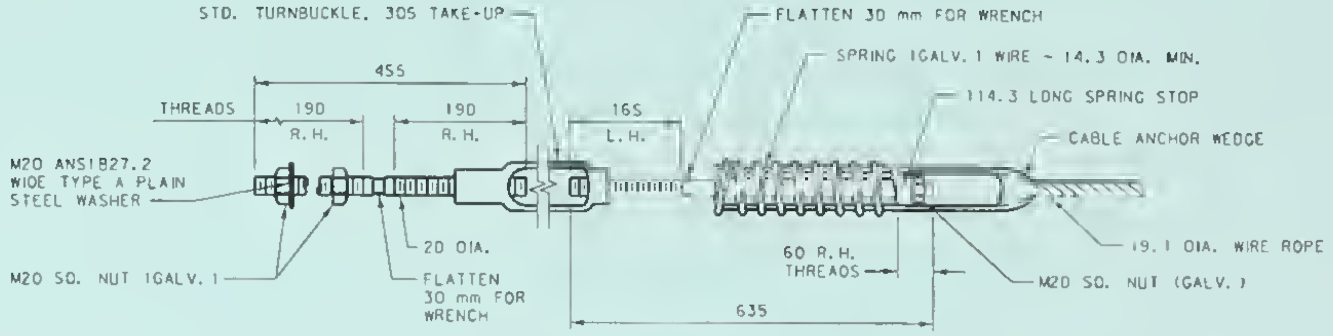
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 606
DWG. NO.
606-92

CABLE GUARDRAIL HARDWARE

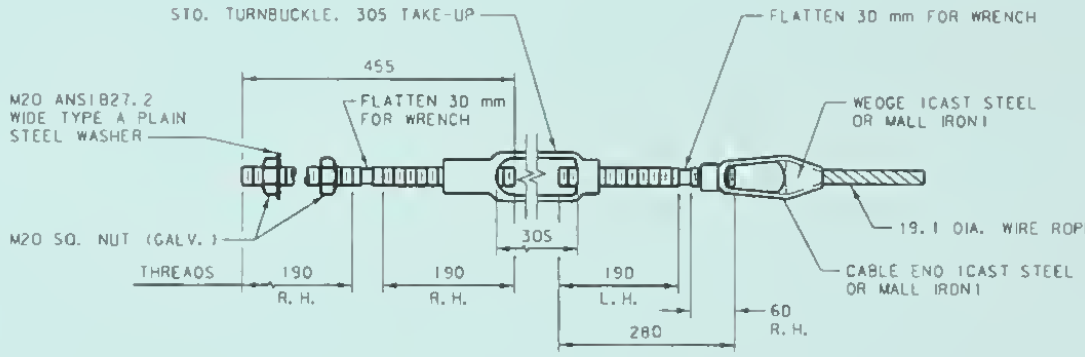
EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

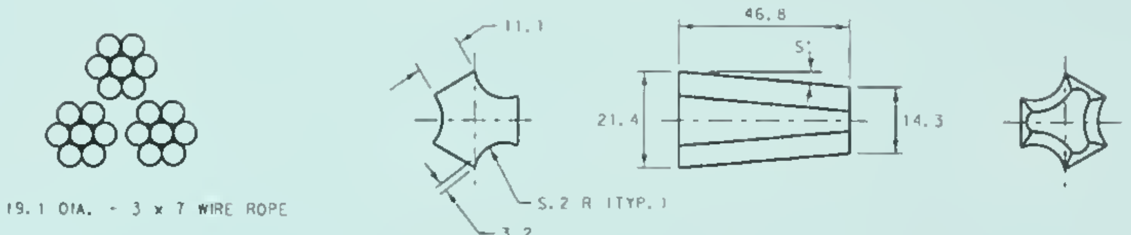


R.H. = RIGHT HAND
L.H. = LEFT HAND

COMPENSATING CABLE END ASSEMBLY


STD. TURNBUCKLE, 305 TAKE-UP
FLATTEN 30 mm FOR WRENCH
455
M20 ANSI B27.2 WIDE TYPE A PLAIN STEEL WASHER
FLATTEN 30 mm FOR WRENCH
WEDGE (CAST STEEL OR MALL IRON)
19.1 DIA. WIRE ROPE
M20 SQ. NUT (GALV.)
305
THREADS
190
R.H.
190
R.H.
190
L.H.
CABLE END (CAST STEEL OR MALL IRON)
60
R.H.
280

TURNBUCKLE CABLE END ASSEMBLY



WEDGE DETAIL

19.1 DIA. WIRE ROPE

RE-1-76

NOTES:

WIRE ROPE AND CONNECTING HARDWARE ARE TO CONFORM TO THE REQUIREMENTS OF AASHTO M 30 CLASS A, 19.1 mm ROPE. CONNECTING HARDWARE MUST DEVELOP THE FULL STRENGTH OF A SINGLE CABLE (111.2 kN). CAST STEEL COMPONENTS ARE TO CONFORM TO THE REQUIREMENTS OF AASHTO M 103M (ASTM A 27M). MALLEABLE IRON CASTINGS ARE TO CONFORM TO THE REQUIREMENTS OF ASTM A 47M.

AT ALL LOCATIONS WHERE THE CABLE IS CONNECTED TO A CABLE SOCKET WITH A WEDGE TYPE CONNECTION, CRIMP ONE WIRE OF THE WIRE ROPE OVER THE BASE OF THE WEDGE TO HOLD IT FIRMLY IN PLACE.

COMPENSATING DEVICES ARE TO HAVE SPRING CONSTANTS OF 78.8 N/mm, PLUS OR MINUS 8.8 N/mm, AND PERMIT A TRAVEL OF 150 mm PLUS OR MINUS 25 mm.

DESIGN SOCKET BASKETS FOR USE WITH THE WEDGE DETAILED IN THIS DRAWING.

ALTERNATE HARDWARE DESIGNS WILL BE CONSIDERED FOR APPROVAL PROVIDED THEIR CONNECTION DETAILS, FOR THE PURPOSE OF MAINTENANCE SUBSTITUTIONS, ARE COMPATIBLE WITH THE DETAILS OF THIS DRAWING AND THEIR OPERATING CHARACTERISTICS ARE SIMILAR TO THOSE OF THE HARDWARE IN THIS DRAWING.

THREADS OF EXTERNALLY THREADED PARTS ARE TO BE UNC, CLASS 2A TOLERANCE (ANSI B1.1). INTERNALLY THREADED PARTS ARE TO MEET THE DIMENSIONAL REQUIREMENTS OF ASTM A 563M.

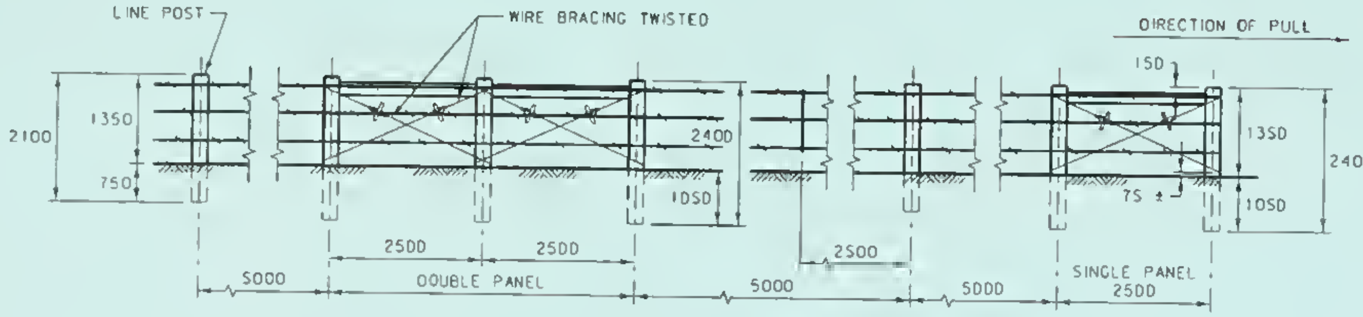
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 606
DWG. NO.
606-94

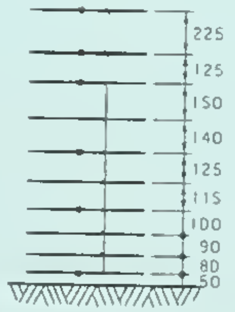
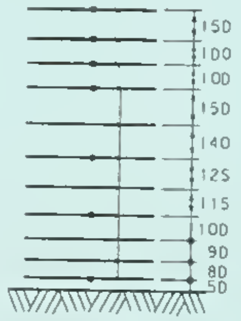
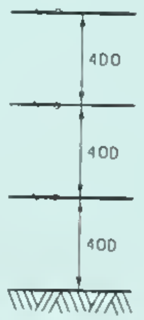
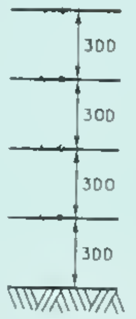
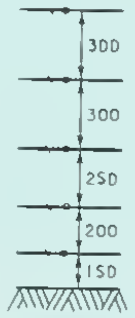
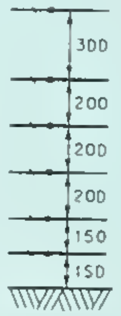
CABLE GUARDRAIL HARDWARE

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



WIRE SPACING TABLE

COMBINATION WOVEN WIRE & BARBED WIRE FENCE		BARBED WIRE FENCE			
1.2 m FENCE HEIGHT		1.2 m FENCE HEIGHT			
800 WW-2 BW *	800 WW-3 BW *	3 BW	4 BW	5 BW	6 BW
TYPE F2-800WW	TYPE F3-800WW	TYPE F3	TYPE F4	TYPE F5	TYPE F6
 225 125 150 140 125 115 100 90 80 50	 150 100 100 150 140 125 115 100 90 80 50				
APPROXIMATE WEIGHT OF 800 mm WOVEN WIRE FABRIC (832-6-12.5) PER 100 m ROLL IS 68 kg ±5 kg (NOTE: 12.5 GAGE) ○ DENOTES STAPLE LOCATIONS					

* OTHER WOVEN WIRE HEIGHTS AND NUMBER OF BARBED WIRE COMBINATIONS ARE AVAILABLE.

STAYS

1. USE WIRE STAYS ON ALL FENCES UNLESS WOOD STAYS ARE SPECIFIED.
2. LOCATE STAYS HALFWAY BETWEEN LINE POSTS.
3. WIRE STAYS FOR BARBED WIRE FENCING ARE 50 mm LONGER THAN THE DISTANCE BETWEEN THE TOP AND BOTTOM WIRES.
4. FOR WOVEN WIRE FENCING WITH BARBED WIRE ON TOP, EXTEND WIRE STAYS 150 mm MINIMUM BELOW THE TOP OF THE WOVEN WIRE.
5. WHEN WOOD STAYS ARE SPECIFIED, USE EITHER 50 mm ROUND, A ROUGH DIMENSION 50 mm × 50 mm, OR A 37.5 mm x 87.5 mm (NOMINAL 50 mm x 100 mm). THE STAY MUST BE OF SUFFICIENT LENGTH TO BE PLACED ON THE GROUND WITH THE TOP OF THE STAY EXTENDING 50 mm ABOVE THE TOP WIRE. ATTACH EACH WIRE TO THE WOOD STAYS USING 44 mm x 9 GAGE STAPLES. WOOD STAYS DO NOT NEED TO BE TREATED.

NOTES:

"M" DENOTES METAL POSTS, EG. TYPE F3M.
"W" DENOTES WOOD POSTS, EG. TYPE F4W.

SEE DTL. DWG. NO. 607-05 FOR SINGLE AND DOUBLE PANEL DETAILS.
SEE DTL. DWG. NO. 607-10 FOR ADDITIONAL FENCING DETAILS.

SEE THE STANDARD SPECIFICATIONS FOR POST REQUIREMENTS.

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 607
DWG. NO.
607-00

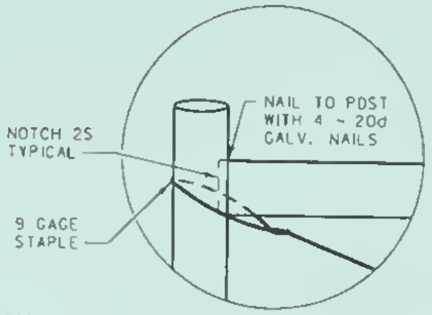
FARM FENCE

EFFECTIVE: AUGUST 1999

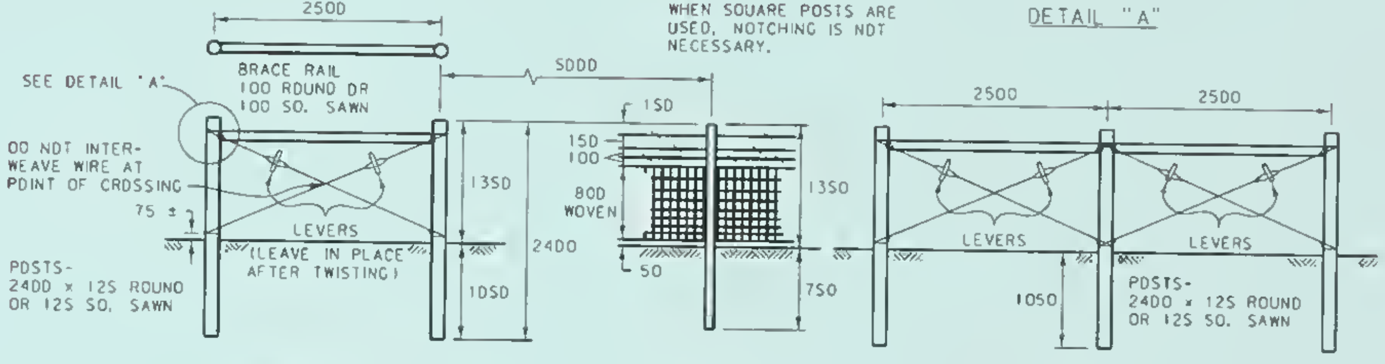
MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

BRACE WIRES - ONE CONTINUOUS 9 OR 12.5 GAGE SMOOTH WIRE DOUBLED TO FORM A FOUR WIRE BRACE. TIE THE TWO ENDS NEAR THE TOP OF THE PANEL POSTS.

LEVERS - 37.5 × 50 × 300 MINIMUM SIZE.



DETAIL "A"

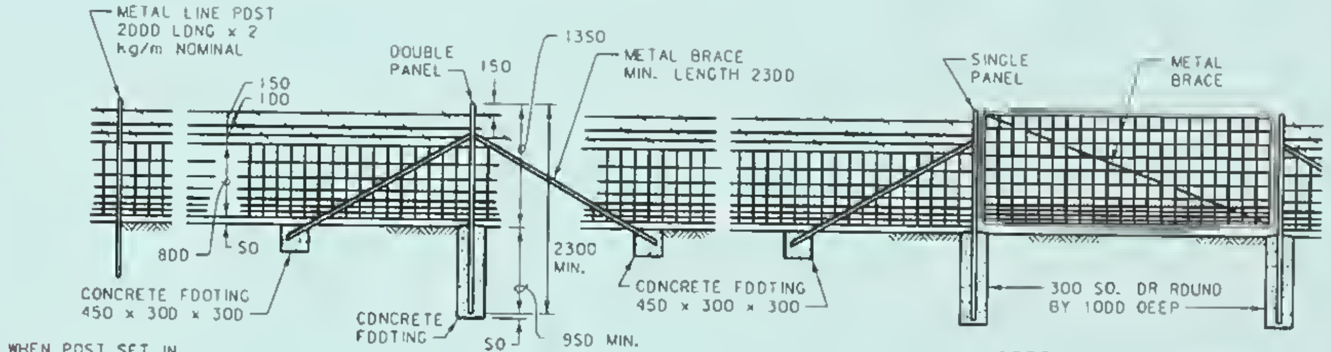

2500
BRACE RAIL 100 ROUND OR 100 SQ. SAWN
SEE DETAIL "A"
DO NOT INTER-WEAVE WIRE AT POINT OF CROSSING
75 ±
LEVERS (LEAVE IN PLACE AFTER TWISTING)
POSTS- 2400 × 125 ROUND OR 125 SQ. SAWN
1350
1050
2400
5000
WHEN SQUARE POSTS ARE USED, NOTCHING IS NOT NECESSARY.
150
150
100
800 WOVEN
50
1350
750
2500
2500
LEVERS
LEVERS
1050
POSTS- 2400 × 125 ROUND OR 125 SQ. SAWN

SINGLE PANEL
FOR PULLING, STRETCHING, CHANGES IN VERTICAL ALIGNMENT OR PANELS ON A RUN OF LESS THAN 100 m.

LINE POST
2100 × 100 MIN. ROUND OR 100 × 100 SQ. SAWN

DOUBLE PANEL
FOR CORNERS, PULLING OR STRETCHING, AND CHANGES IN HORIZONTAL ALIGNMENT.

TYPE "CW" - "STRAIGHT RUN" FENCE WITH WOOD POSTS


METAL LINE POST 2000 LONG x 2 kg/m NOMINAL
150
100
800
50
CONCRETE FOOTING 450 x 300 x 300
DOUBLE PANEL
150
1350
METAL BRACE MIN. LENGTH 2300
2300 MIN.
CONCRETE FOOTING
50
950 MIN.
CONCRETE FOOTING 450 x 300 x 300
SINGLE PANEL
METAL BRACE
300 SQ. OR ROUND BY 1000 DEEP
WHEN POST SET IN SOLID ROCK, PROVIDE 450 MIN. BURIAL.

STEEL GATE & BRACING

TYPE "CM" - FENCE WITH STEEL POSTS

NOTES:

SEE THE STANDARD SPECIFICATIONS FOR POST AND GATE REQUIREMENTS.

PLACE ALL FENCE WIRE ON PASTURE SIDE OF POST, EXCEPT ON CURVES. THEN, PLACE THE WIRE ON THE OUTSIDE OF THE CURVE.

IN AREAS SUBJECT TO HIGH VELOCITY WINDS AND MOVING DEBRIS, WIRES MAY BE PLACED ON WINDWARD SIDE OF POSTS, EXCEPT ON CURVES.

ALL CONCRETE IS CLASS "F" OR BETTER.

POST SPACING IS GENERALLY MEASURED PARALLEL TO GROUND.

LINE POST SPACING IS 5000 mm CENTER TO CENTER. LINE POST SPACING FROM BRACE OR PANEL POST IS 5000 mm CENTER TO CENTER.

PLACE 600 mm WIRE STAY HALFWAY BETWEEN POSTS. DO NOT PLACE STAYS ON PANELS FOR "CM" AND "CW" FENCE.

TYPE "CW" FENCE HAS ONE METAL POST IN PLACE OF A WOODEN LINE POST IN EACH 150 m RUN FOR LIGHTNING PROTECTION.

USE TYPE "CW" (WOOD) PANELS ON ALL TYPE "CM" (METAL) FENCES INSTEAD OF STEEL PANELS UNLESS OTHERWISE SPECIFIED.

SET STEEL CORNER, END, GATE AND PULL POSTS, AND EACH BRACE IN CONCRETE AS SHOWN.

SEE DTL. DWG. NO. 607-10 FOR ADDITIONAL FENCING DETAILS.

A DEADMAN MAY BE A PRECAST CONCRETE BLOCK, A CAST IN PLACE CONCRETE BLOCK, A ROCK OR OTHER APPROVED OBJECT WEIGHING AT LEAST 70 kg. BURY THE DEADMAN IN THE GROUND WITH AT LEAST 600 mm OF COVER. ATTACH THE DEADMAN TO THE FENCE WITH 3 STRANDS OF 9 GAGE WIRE OR 6 STRANDS OF 12.5 GAGE WIRE. SEE DETAILED DRAWING NO. 607-10 FOR ALTERNATE DEADMAN.

STAPLE THE BOTTOM, TOP, CENTER AND ALTERNATE WIRES OF WOVEN WIRE TO WOOD LINE POSTS.

TIE THE BOTTOM, TOP, CENTER AND ALTERNATE WIRES OF WOVEN WIRE TO STEEL LINE POSTS.

STAPLE ALL WIRES OF WOVEN WIRE TO WOOD CORNER POSTS OR POST USED TO TIE-OFF WIRE.

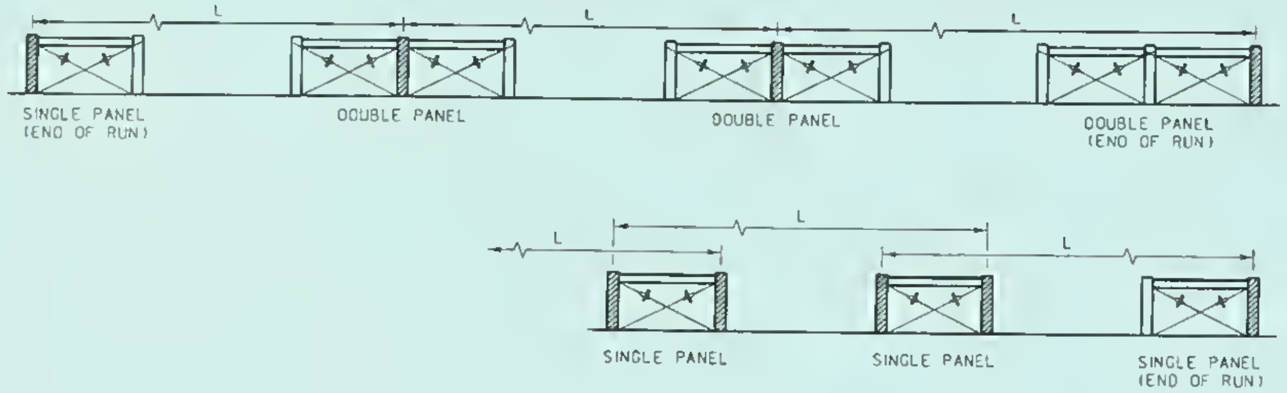
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 607
DWG. NO.
607-05

INTERSTATE FENCE

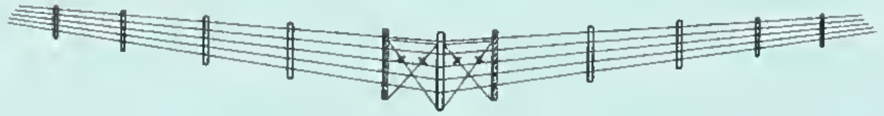
EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD


L
L
L
SINGLE PANEL (END OF RUN)
DOUBLE PANEL
DOUBLE PANEL
DOUBLE PANEL (END OF RUN)
L
L
L
SINGLE PANEL
SINGLE PANEL
SINGLE PANEL (END OF RUN)

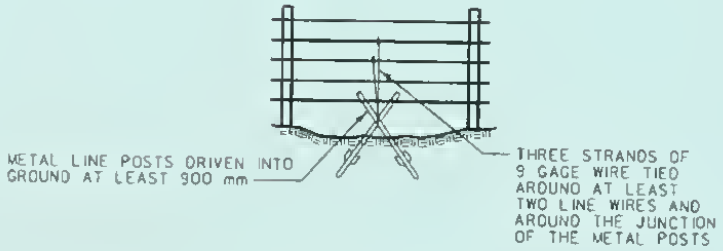
FENCE TYPE	RUN = L (m)	PANELS REQUIRED
COMBINATION WOVEN/BARBED	LESS THAN 10	NONE
	10 - 100	SINGLE
	OVER 100 TO 200 MAX.	DOUBLE
BARBED	LESS THAN 20	NONE
	20 - 200	SINGLE
	OVER 200 TO 300 MAX.	DOUBLE

NOTE:
TIE OFF ON ALL CROSS HATCHED OR SHADED POSTS.



DOUBLE PANEL AT FENCE CORNER OR ANGLE BREAK

FENCE PANEL TYPES


METAL LINE POSTS DRIVEN INTO GROUND AT LEAST 900 mm
THREE STRANDS OF 9 GAGE WIRE TIED AROUND AT LEAST TWO LINE WIRES AND AROUND THE JUNCTION OF THE METAL POSTS

ALTERNATE DEADMAN

WHEN APPROVED BY THE ENGINEER THE ABOVE DEADMAN MAY BE USED IN LIEU OF A ROCK OR PRECAST CONCRETE BLOCK AS SPECIFIED ON DTL. DWG. NO. 607-05.

NOTES:

ATTACH BARBED WIRES TO POSTS BY WRAPPING AROUND THE POST AT LEAST TWO TIMES, THEN WRAPPING AROUND ITSELF FIVE TIMES.

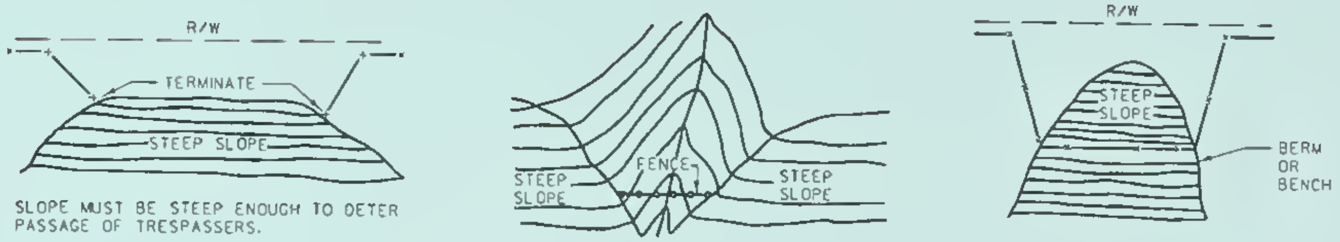
TO ATTACH WOVEN WIRE TO AN END POST, REMOVE TWO OR THREE VERTICAL STAY WIRES FROM THE END OF THE FENCE. PLACE THE FIRST COMPLETE VERTICAL STAY WIRE AGAINST THE POST. START AT THE MIDDLE OF THE HORIZONTAL LINE WIRES, WRAPPING AROUND THE END POST AT LEAST TWO TIMES AND THEN WRAPPING AROUND ITSELF FIVE TIMES.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 607
DWG. NO.
607-10

FENCING DETAILS

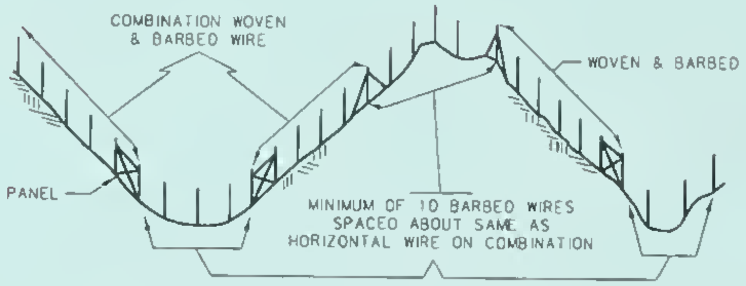
EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

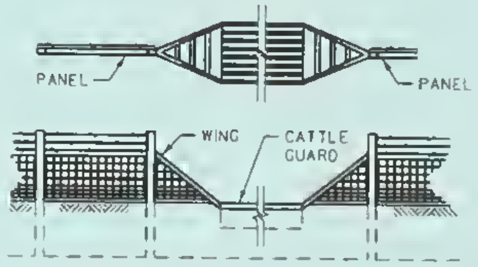


SLOPE MUST BE STEEP ENOUGH TO DETER PASSAGE OF TRESPASSERS.

FENCE LAYOUT ON STEEP SLOPES

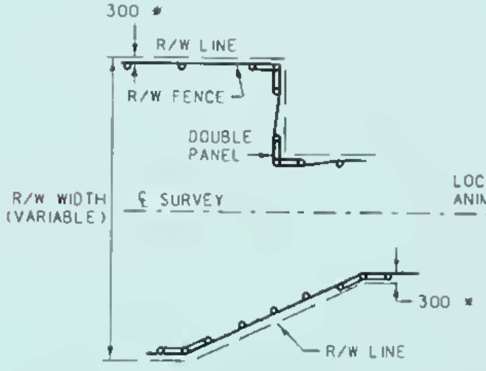

COMBINATION WOVEN & BARBED WIRE
WOVEN & BARBED
PANEL
MINIMUM OF 10 BARBED WIRES SPACED ABOUT SAME AS HORIZONTAL WIRE ON COMBINATION

FENCE LAYOUT ON SHARP VERTICAL CURVES
TO AVOID TRYING TO CONFORM WOVEN WIRE TO UNEVEN TERRAIN

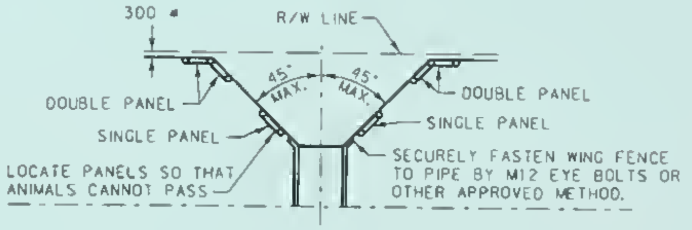


FENCE CONNECTION TO CATTLE GUARD
SECURELY FASTEN FENCE WIRE TO THE WINGS AND ARRANGE SO THAT ANIMALS CANNOT PASS.

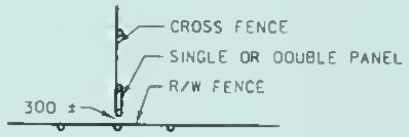
* 300 mm OFFSET APPLIES TO INTERSTATE FENCING ONLY.



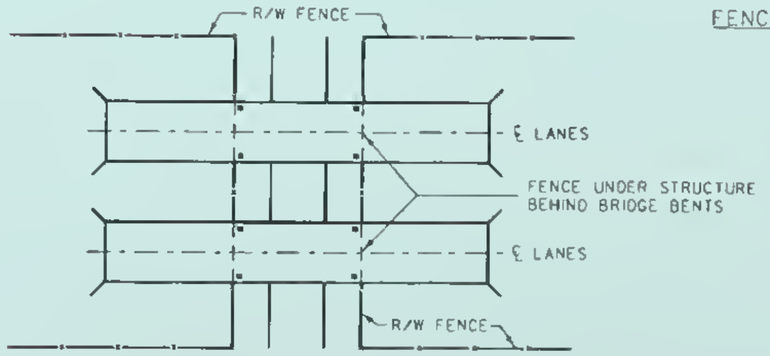
FENCE LAYOUT AT CHANGE IN R/W WIDTH


300 *
R/W LINE
45° MAX.
45° MAX.
DOUBLE PANEL
DOUBLE PANEL
SINGLE PANEL
SINGLE PANEL
LOCATE PANELS SO THAT ANIMALS CANNOT PASS
SECURELY FASTEN WING FENCE TO PIPE BY M12 EYE BOLTS OR OTHER APPROVED METHOD.

FENCE LAYOUT AT STOCKPASS, BRIDGES AND LARGE PIPES



FENCE LAYOUT AT CROSS-FENCE CONNECTION



FENCE LAYOUT AT LOCAL ROAD UNDER INTERSTATE

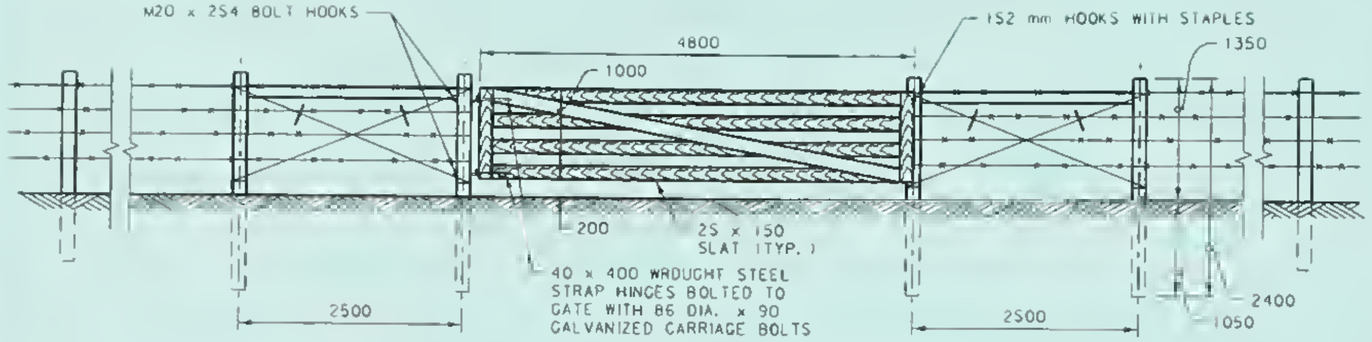
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 607
DWG. NO.
607-15

FENCING DETAILS

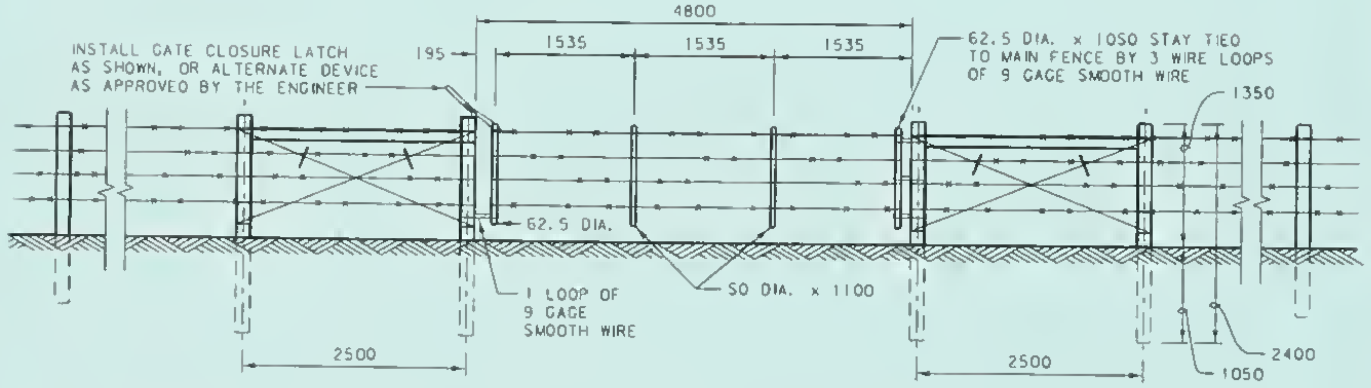
EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD


M20 x 254 BOLT HOOKS
4800
1000
152 mm HOOKS WITH STAPLES
1350
200
25 x 150 SLAT (TYP.)
40 x 400 WROUGHT STEEL STRAP HINGES BOLTED TO GATE WITH 86 DIA. x 90 GALVANIZED CARRIAGE BOLTS
2500
2500
2400
1050

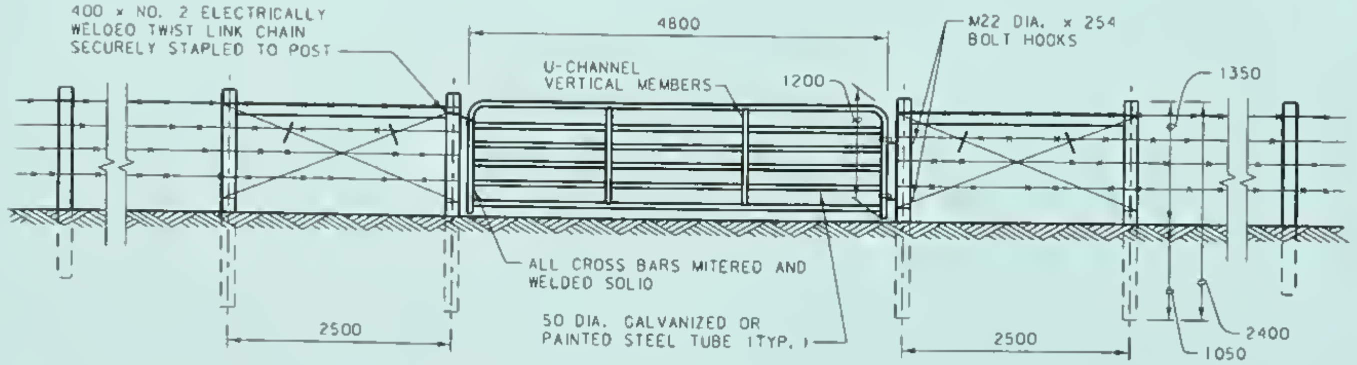
WOOD FARM ENTRANCE GATE (TYPE G-1)

NOTE: USE 10d NAILS AND CLINCH FOR GATE CONSTRUCTION.


INSTALL GATE CLOSURE LATCH AS SHOWN, OR ALTERNATE DEVICE AS APPROVED BY THE ENGINEER
195
4800
1535
1535
1535
62.5 DIA. x 1050 STAY TIED TO MAIN FENCE BY 3 WIRE LOOPS OF 9 GAGE SMOOTH WIRE
1350
62.5 DIA.
1 LOOP OF 9 GAGE SMOOTH WIRE
50 DIA. x 1100
2500
2500
2400
1050

WIRE FARM ENTRANCE GATE (TYPE G-2)

NOTE:
USE SAME WIRE SCHEME ON GATE AS THAT USED ON FENCE, UNLESS STATED OTHERWISE IN R/W AGREEMENT.


400 x NO. 2 ELECTRICALLY WELDED TWIST LINK CHAIN SECURELY STAPLED TO POST
4800
U-CHANNEL VERTICAL MEMBERS
1200
M22 DIA. x 254 BOLT HOOKS
1350
ALL CROSS BARS MITERED AND WELDED SOLID
50 DIA. GALVANIZED OR PAINTED STEEL TUBE (TYP.)
2500
2500
2400
1050

METAL FARM ENTRANCE GATE (TYPE G-3)

NOTES:

ALL GATES ARE 4800 mm WIDE UNLESS R/W AGREEMENT STATES OTHERWISE.

ALL GATES WILL HAVE A SINGLE OR DOUBLE PANEL AT EACH END.

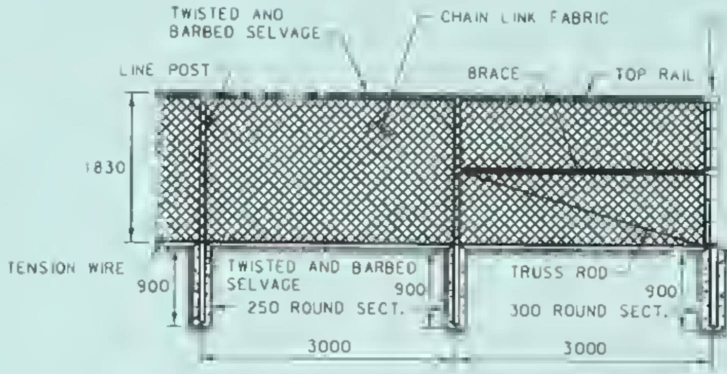
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 607
DWG. NO.
607-20

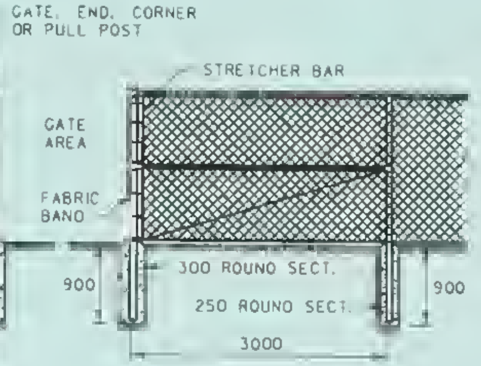
FARM ENTRANCE
GATES

EFFECTIVE: AUGUST 1999

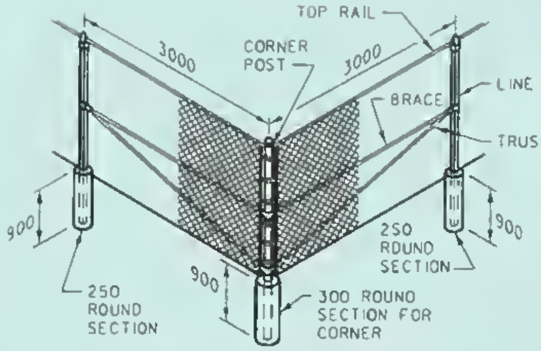
MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



1.8 m CHAIN LINK FENCE

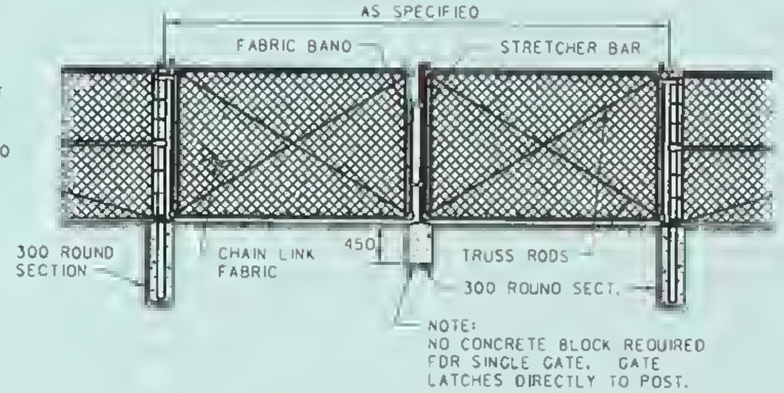


SINGLE PANEL



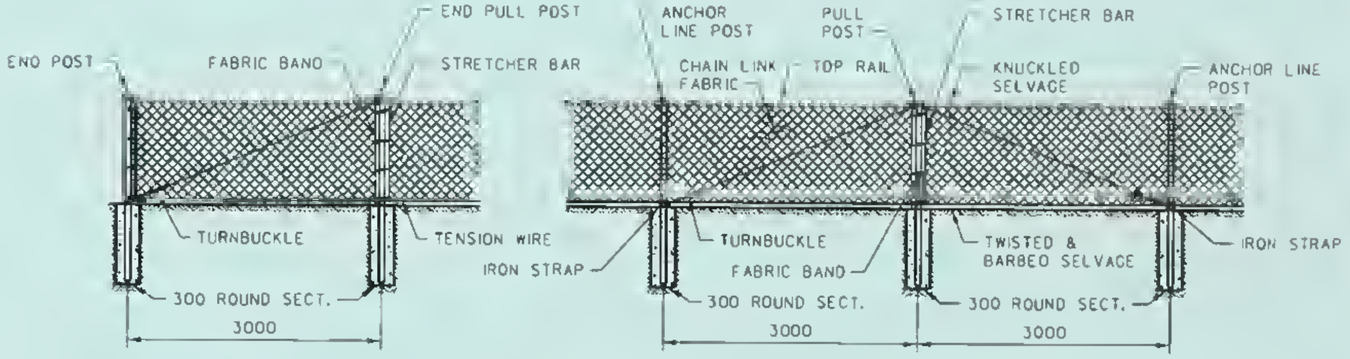
DOUBLE PANEL

PULL POST AND CORNER POST BRACING



NOTE:
NO CONCRETE BLOCK REQUIRED FOR SINGLE GATE. GATE LATCHES DIRECTLY TO POST.

GATES



CHAIN LINK FENCE - 0.9 m, 1.2 m AND 1.5 m

NOTES:

SEE THE STANDARD SPECIFICATIONS FOR FURTHER REQUIREMENTS.

DO NOT INSTALL DOUBLE PANELS MORE THAN 90 m APART ON TANGENTS OR MORE THAN 75 m APART ON ANY CURVE. FOR CURVES WITH A RADIUS SHARPER THAN 350 m, INSTALL A DOUBLE PANEL ON EACH CURVE END, PLUS ONE ADDITIONAL PANEL FOR EACH 10' OF DEFLECTION, EVENLY SPACED, BETWEEN THE CURVE ENDS.

PULL POST BRACING ON 1.8 m FENCE IS THE SAME AS CORNER BRACING.

A DROP BAR LOCKING DEVICE IS REQUIRED FOR ALL DOUBLE GATE INSTALLATIONS. THE DROP BAR MUST BE ABLE TO BE INSERTED INTO THE CONCRETE BLOCK AT LEAST 150 mm.

ALL CONCRETE IS CLASS "F" OR BETTER.

WHEN FENCE IS LESS THAN 15 m FROM THE EDGE OF A DRIVING LANE, USE A 9.5 mm DIA. GALVANIZED STEEL CABLE IN PLACE OF THE TOP METAL BRACE RAIL.

HEIGHT OF FABRIC	WIRE FABRIC ABOVE GROUND	DEPTH OF CONCRETE	DEPTH OF POST IN CONC. (MIN.)
1830	25 TO 50	900	800
1525	25 TO 50	900	800
1220	25 TO 50	750	650
915	25 TO 50	750	650

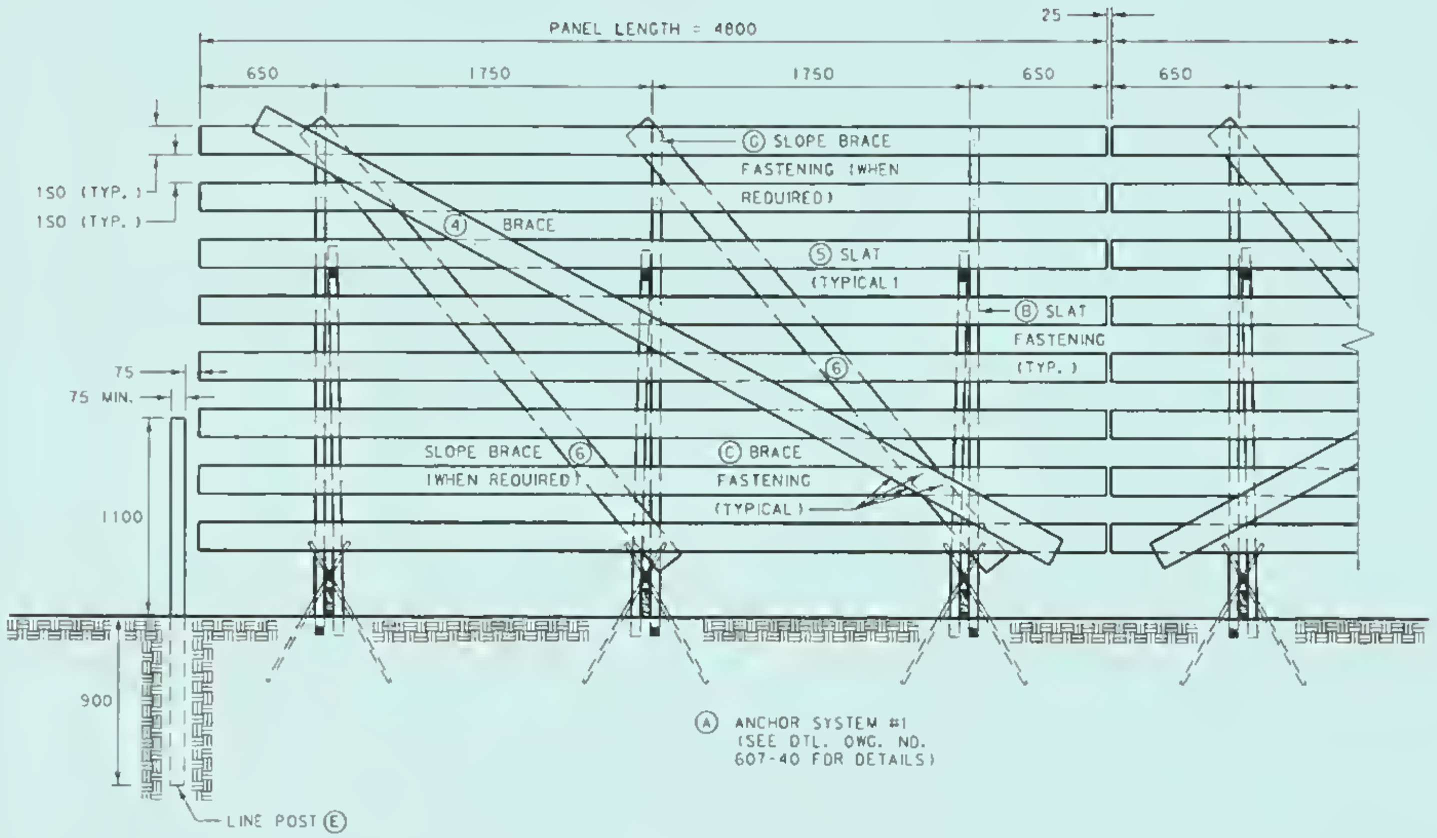
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 607
DWG. NO.
607-25

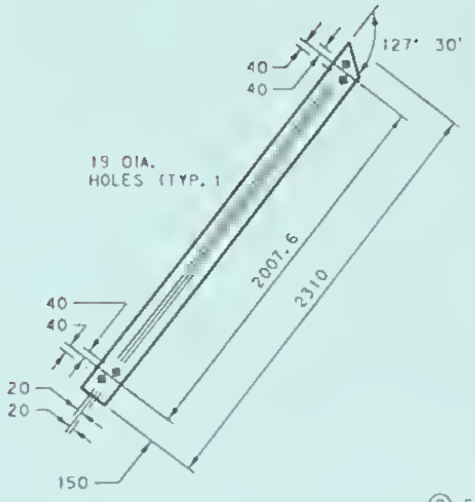
CHAIN LINK FENCE

EFFECTIVE: AUGUST 1999

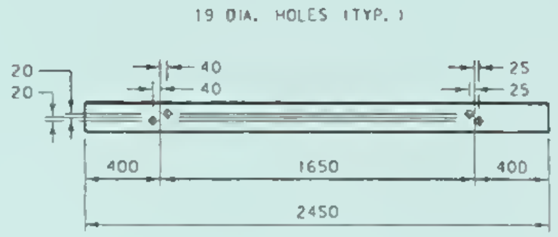
MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD


PANEL LENGTH = 4800
25
650
1750
1750
650
650
150 (TYP.)
150 (TYP.)
Ⓖ SLOPE BRACE FASTENING (WHEN REQUIRED)
④ BRACE
⑤ SLAT (TYPICAL)
Ⓑ SLAT FASTENING (TYP.)
⑥
75
75 MIN.
SLOPE BRACE ⑥ (WHEN REQUIRED)
Ⓒ BRACE FASTENING (TYPICAL)
1100
900
Ⓐ ANCHOR SYSTEM #1 (SEE DTL. DWG. NO. 607-40 FOR DETAILS)
LINE POST Ⓔ

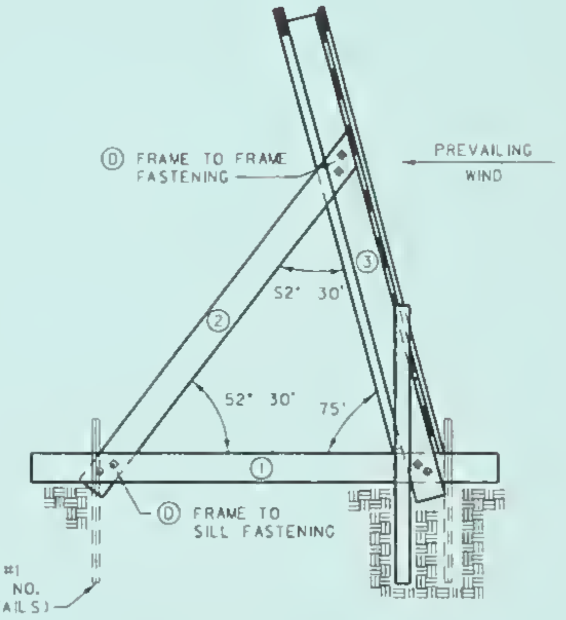
FRONT VIEW



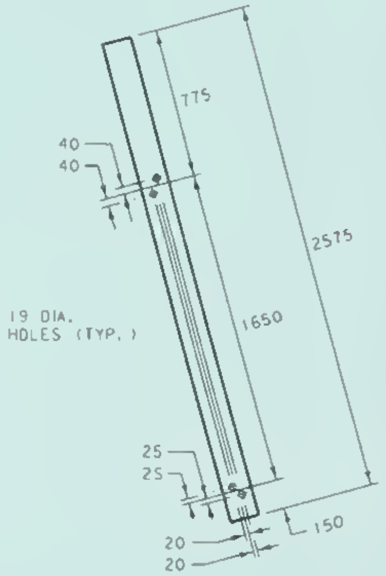
② FRAME



① SILL


Ⓓ FRAME TO FRAME FASTENING
PREVAILING WIND
③
52° 30'
②
52° 30'
75°
①
Ⓓ FRAME TO SILL FASTENING
Ⓐ ANCHOR SYSTEM #1 (SEE DTL. DWG. NO. 607-40 FOR DETAILS)

END VIEW



③ FRAME

GENERAL NOTES

Ⓐ ANCHOR SYSTEM DETAIL
USE ANCHOR SYSTEM #1 UNLESS SOIL AND MOISTURE CONDITIONS NECESSITATE THE USE OF AN ALTERNATE SYSTEM, OR AS DIRECTED BY THE ENGINEER. CONSULT DETAILED DRAWING NUMBERS 607-40 AND 607-45 FOR ANCHOR SYSTEMS #3 (ROCKY CONDITIONS) AND #2 (SWAMPY CONDITIONS).

Ⓑ SLAT FASTENING
FASTEN SLATS TO THE FRAME WITH 3 ~ 12d COMMON BARBED SHANK NAILS AT EACH LOCATION.

Ⓒ BRACE FASTENING
FASTEN BRACES TO THE FRAME WITH 4 ~ 8d COMMON NAILS AT EACH LOCATION AND CLINCH.

Ⓓ FRAME TO SILL AND FRAME TO FRAME FASTENING
FASTEN THE SILL AND FRAME MEMBERS TO THE FRAME AT EACH LOCATION WITH 2 ~ M16 x 127 mm STANDARD MACHINE BOLTS, EACH WITH HEX NUT AND TWO FLAT WASHERS. SEE NOTE Ⓧ AT RIGHT.

Ⓔ LINE POSTS
PLACE LINE POSTS AT EACH END OF EACH LINE OF SNOW FENCE AS SHOWN. POSTS ARE 2000 mm LONG WITH A MINIMUM DIAMETER OF 75 mm AND A MAXIMUM DIAMETER OF 150 mm. BUTT TREAT 900 mm MINIMUM.

Ⓕ WIRE TIE
USE 12 GAGE OR HEAVIER GALVANIZED WIRE TO FORM THE WIRE TIES.

Ⓖ SLOPE BRACE FASTENING
FASTEN SLOPE BRACES WITH 3 ~ 16d COMMON BARBED SHANK NAILS AT EACH LOCATION.

LUMBER - 2.4 m SNOW FENCE W/ ANCHOR SYSTEM #1

BILL OF MATERIALS FOR ONE PANEL

ITEM NO.	NO. OF PIECES	LUMBER SIZE	DESCRIPTION
①*	3	50 x 150 x 2450	FRAME (SILL)
②*	3	50 x 150 x 2310	FRAME
③*	3	50 x 150 x 2575	FRAME
* NOTE: PRESSURE TREAT ALL 50 x 150 MEMBERS (ENTIRE FRAME)			
④	1	25 x 150 x 4800	BRACE
⑤	8	25 x 150 x 4800	SLAT
⑥**	2	50 x 150 x 3000	SLOPE BRACE
** NOTE: USE ONLY WHEN SLOPE IS 5:1 OR GREATER			

HARDWARE - 2.4 m SNOW FENCE W/ ANCHOR SYSTEM #1

BILL OF MATERIALS FOR ONE PANEL

	QUANTITY	DESCRIPTION
Ⓓ	18	M16 x 127 HEX BOLT (THREADED FULL LENGTH) AND NUT
Ⓓ	36	FLAT WASHER FOR M16 BOLT
Ⓑ	0.50 kg	12d COMMON BARBED SHANK NAIL
Ⓐ	12	#19 REBAR x 1500
Ⓕ	6 PIECES	12 GAGE TIE WIRE x 1500 ±
Ⓒ	0.15 kg	8d COMMON NAILS
Ⓖ	0.11 kg	16d COMMON BARBED SHANK NAILS

ALL NAILS MAY BE EITHER HAND DRIVEN OR DRIVEN WITH A PNEUMATIC NAILER.

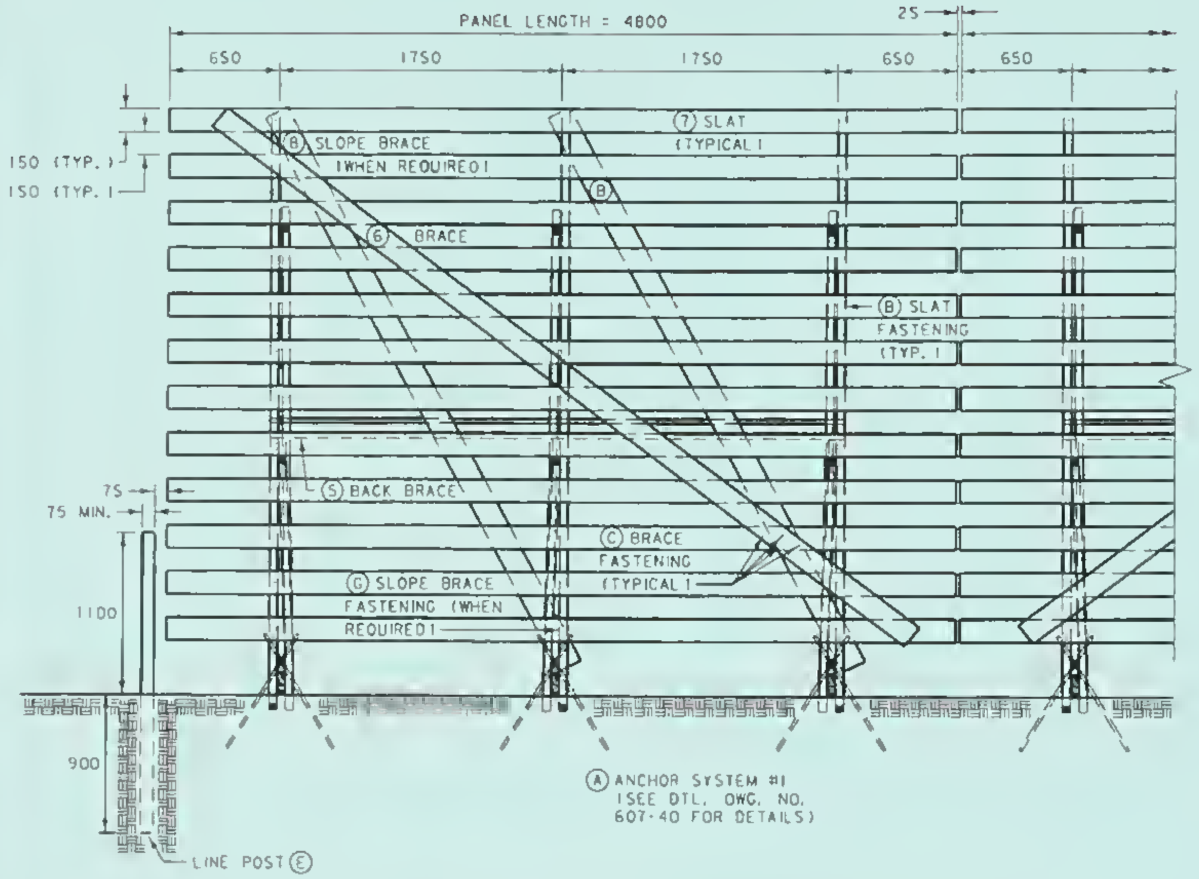
Ⓧ NOTE:
AFTER M16 BOLTS HAVE BEEN TIGHTENED, BURR THE THREAD DIRECTLY BEHIND THE NUT TO PREVENT EVENTUAL LOOSENING OF THE NUTS.

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

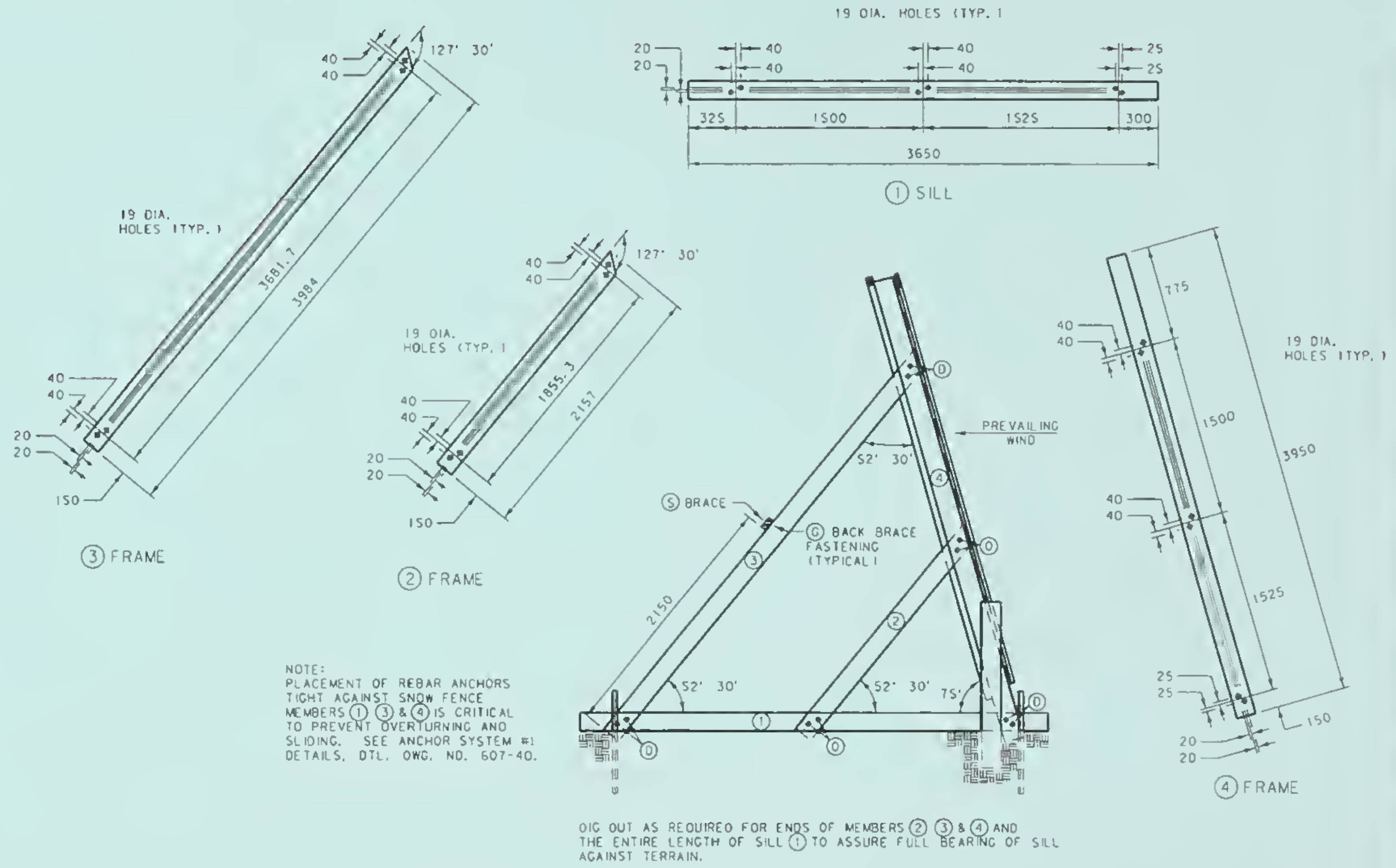
DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 607
DWG. NO.
607-30

2.4 m WOOD SNOW FENCE
W/ ANCHOR SYSTEM #1

EFFECTIVE: AUGUST 1999
MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD


PANEL LENGTH = 4800
25
650
1750
1750
650
650
150 (TYP.)
150 (TYP.)
Ⓑ SLOPE BRACE (WHEN REQUIRED)
⑦ SLAT (TYPICAL)
Ⓑ
⑥ BRACE
Ⓑ SLAT FASTENING (TYP.)
75
75 MIN.
⑤ BACK BRACE
Ⓒ BRACE FASTENING (TYPICAL)
Ⓖ SLOPE BRACE FASTENING (WHEN REQUIRED)
1100
900
Ⓐ ANCHOR SYSTEM #1 (SEE DTL. DWG. NO. 607-40 FOR DETAILS)
LINE POST Ⓔ

FRONT VIEW



NOTE:
PLACEMENT OF REBAR ANCHORS TIGHT AGAINST SNOW FENCE MEMBERS ① ③ & ④ IS CRITICAL TO PREVENT OVERTURNING AND SLIDING. SEE ANCHOR SYSTEM #1 DETAILS, DTL. DWG. NO. 607-40.

DIG OUT AS REQUIRED FOR ENDS OF MEMBERS ② ③ & ④ AND THE ENTIRE LENGTH OF SILL ① TO ASSURE FULL BEARING OF SILL AGAINST TERRAIN.

END VIEW

GENERAL NOTES

Ⓐ ANCHOR SYSTEM DETAIL
USE ANCHOR SYSTEM #1 UNLESS SOIL AND MOISTURE CONDITIONS NECESSITATE THE USE OF AN ALTERNATE SYSTEM, OR AS DIRECTED BY THE ENGINEER. CONSULT DETAILED DRAWING NUMBERS 607-40 AND 607-45 FOR ANCHOR SYSTEMS #3 (ROCKY CONDITIONS) AND #2 (SWAMPY CONDITIONS).

Ⓑ SLAT FASTENING
FASTEN SLATS TO THE FRAME WITH 3 ~ 12d COMMON BARBED SHANK NAILS AT EACH LOCATION.

Ⓒ BRACE FASTENING
FASTEN BRACES TO THE FRAME WITH 4 ~ 8d COMMON NAILS AT EACH LOCATION AND CLINCH.

Ⓓ FRAME TO SILL AND FRAME TO FRAME FASTENING
FASTEN THE SILL AND FRAME MEMBERS TO THE FRAME AT EACH LOCATION WITH 2 ~ M16 x 127 mm STANDARD MACHINE BOLTS, EACH WITH HEX NUT AND TWO FLAT WASHERS. SEE NOTE Ⓧ AT RIGHT.

Ⓔ LINE POSTS
PLACE LINE POSTS AT EACH END OF EACH LINE OF SNOW FENCE AS SHOWN. POSTS ARE 2000 mm LONG WITH A MINIMUM DIAMETER OF 75 mm AND A MAXIMUM DIAMETER OF 150 mm. BUTT TREAT 900 mm MINIMUM.

Ⓕ WIRE TIE
USE 12 GAGE OR HEAVIER GALVANIZED WIRE TO FORM THE WIRE TIES.

Ⓖ BACK & SLOPE BRACE FASTENING
FASTEN BACK BRACES TO THE FRAME WITH 3 ~ 16d NAILS, AND FASTEN THE SLOPE BRACES WITH 3 ~ 16d BARBED SHANK NAILS AT EACH LOCATION.

LUMBER - 3.6 m SNOW FENCE W/ ANCHOR SYSTEM #1			
BILL OF MATERIALS FOR ONE PANEL			
ITEM NO.	NO. OF PIECES	LUMBER SIZE	DESCRIPTION
①*	3	50 x 150 x 3650	SILL
②*	3	50 x 150 x 2157	FRAME
③*	3	50 x 150 x 3984	FRAME
④*	3	50 x 150 x 3950	FRAME
* NOTE: PRESSURE TREAT ALL 50 x 150 MEMBERS (ENTIRE FRAME)			
⑤	1	50 x 100 x 3650	BACK BRACE
⑥	1	25 x 150 x 5400	BRACE
⑦	12	25 x 150 x 4800	SLAT
⑧**	2	50 x 150 x 4000	SLOPE BRACE
** NOTE: USE ONLY WHEN SLOPE IS 5:1 OR GREATER			

	HARDWARE - 3.6 m SNOW FENCE W/ ANCHOR SYSTEM #1	
	BILL OF MATERIALS FOR ONE PANEL	
	QUANTITY	DESCRIPTION
Ⓓ	30	M16 x 127 HEX BOLT (THREADED FULL LENGTH) AND NUT
Ⓓ	60	FLAT WASHER FOR M16 BOLT
Ⓒ	0.23 kg	8d COMMON NAILS
Ⓑ	0.76 kg	12d COMMON BARBED SHANK NAILS
Ⓖ	0.23 kg	16d COMMON BARBED SHANK NAILS
Ⓐ	12	#19 REBAR x 1500
Ⓕ	6 PIECES	12 GAGE TIE WIRE x 1500 ±

ALL NAILS MAY BE EITHER HAND DRIVEN OR DRIVEN WITH A PNEUMATIC NAILER.

Ⓧ NOTE:
AFTER M16 BOLTS HAVE BEEN TIGHTENED, BURR THE THREAD DIRECTLY BEHIND THE NUT TO PREVENT EVENTUAL LOOSENING OF THE NUTS.

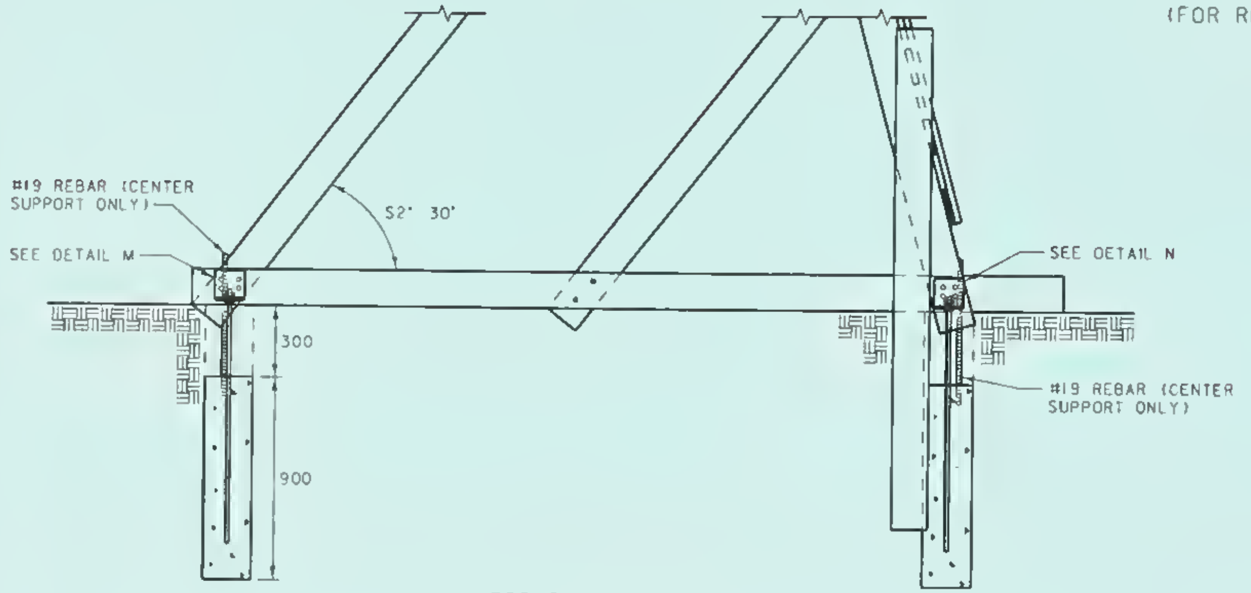
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 607
DWG. NO.
607-35

3.6 m WOOD SNOW FENCE
W/ ANCHOR SYSTEM #1

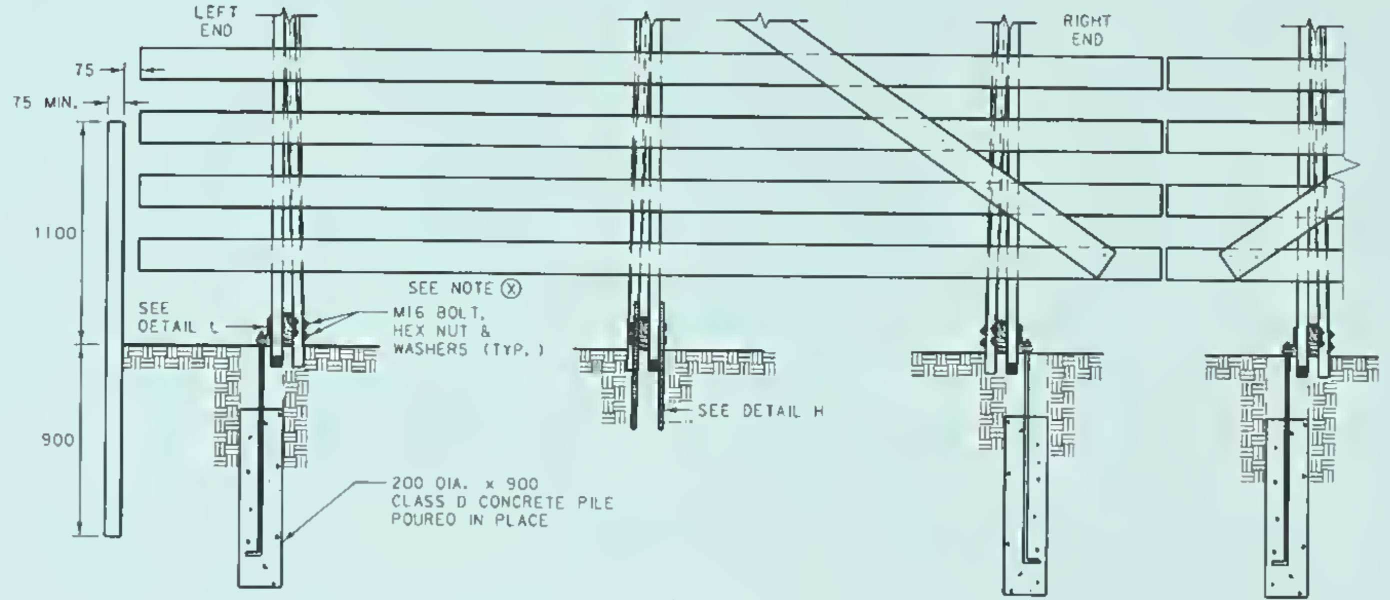
EFFECTIVE: AUGUST 1999
MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

ANCHOR SYSTEM #3
(FOR ROCKY CONDITIONS)



#19 REBAR (CENTER SUPPORT ONLY)
52° 30'
SEE DETAIL M
SEE DETAIL N
300
900
#19 REBAR (CENTER SUPPORT ONLY)

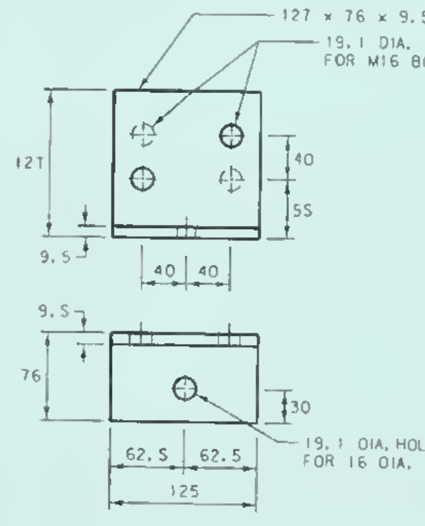
LEFT END VIEW



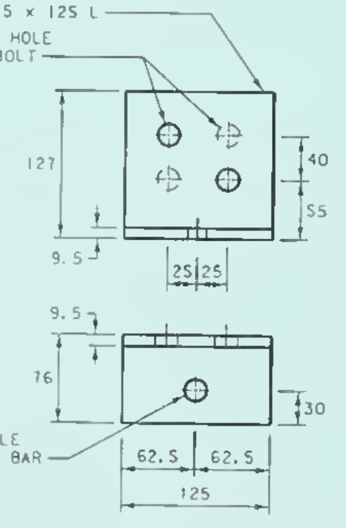
LEFT END
RIGHT END
75
75 MIN.
1100
900
SEE NOTE ⓧ
M16 BOLT, HEX NUT & WASHERS (TYP.)
SEE DETAIL L
SEE DETAIL H
200 DIA. x 900 CLASS D CONCRETE PILE POURED IN PLACE

FRONT VIEW

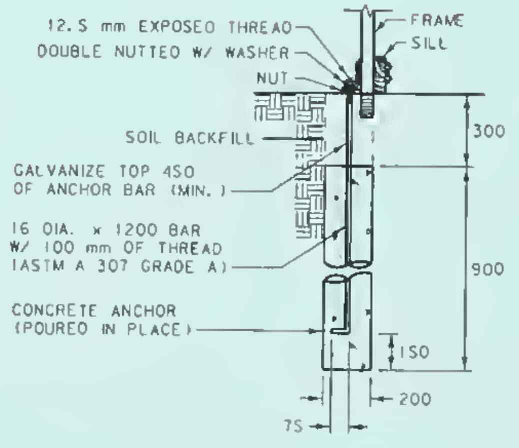
NOTE:
HOLES SHOWN IN DETAILS BELOW ARE FOR LEFT END OF FENCE.
HOLES SHOWN HIDDEN ARE FOR RIGHT END OF FENCE.



DETAIL M

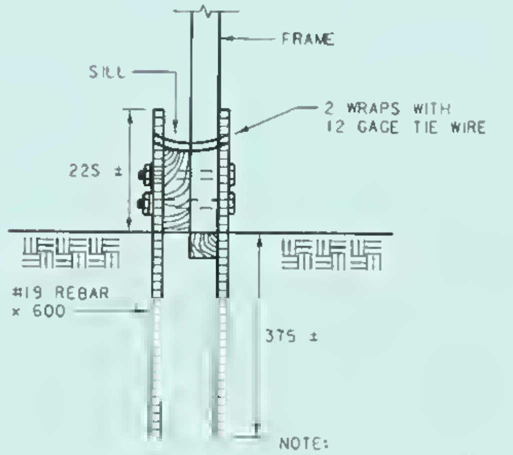


DETAIL N



12.5 mm EXPOSED THREAD
DOUBLE NUTTED W/ WASHER
NUT
FRAME
SILL
SOIL BACKFILL
GALVANIZE TOP 450 OF ANCHOR BAR (MIN.)
16 DIA. x 1200 BAR W/ 100 mm OF THREAD (ASTM A 307 GRADE A)
CONCRETE ANCHOR (POURED IN PLACE)
300
900
150
200
75

DETAIL L



NOTE:
USE ON FRONT AND BACK OF CENTER SUPPORT.

DETAIL H

LUMBER - SNOW FENCE W/ ANCHOR SYSTEM #3
BILL OF MATERIALS FOR ONE PANEL
SAME AS FOR SNOW FENCE W/ ANCHOR SYSTEM #1

HARDWARE - SNOW FENCE W/ ANCHOR SYSTEM #3

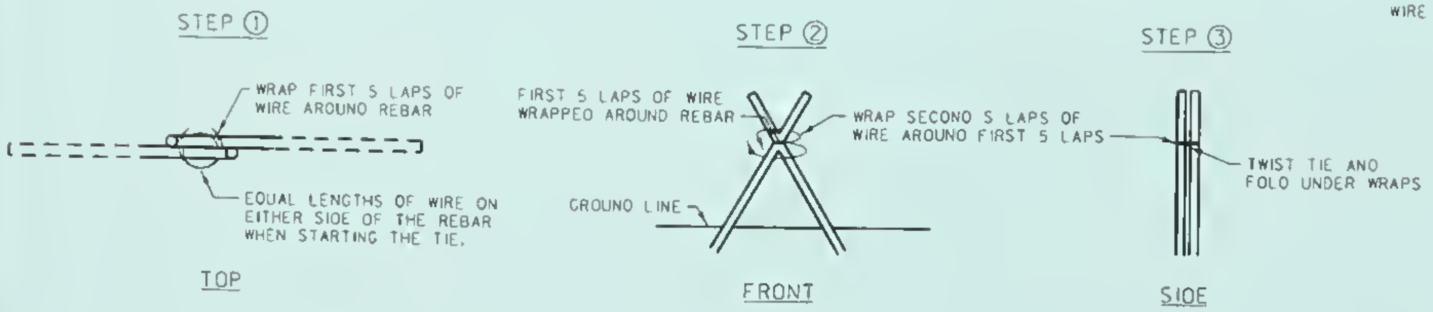
BILL OF MATERIALS FOR ONE PANEL

QUANTITY	DESCRIPTION
4	127 x 76 x 9.5 x 127.0 L
4	16 DIA. x 1200 BAR W/ 3 HEX NUTS
4	FLAT WASHERS FOR 16 DIA. BAR
0.113 m³	CLASS D CONCRETE
4	#19 REBAR x 600
4 PIECES	12 GAGE TIE WIRE x 600 ±
30	M16 x 127 HEX BOLT (THREADED FULL LENGTH) AND NUT — SEE NOTE ⓧ BELOW
60	FLAT WASHERS FOR M16 BOLT

NOTE: NAILS REQUIRED ARE SAME AS SHOWN ON HARDWARE SUMMARY FOR SNOW FENCE W/ ANCHOR SYSTEM #1

ⓧ NOTE:
AFTER M16 BOLTS HAVE BEEN TIGHTENED,
BURR THE THREAD DIRECTLY BEHIND THE NUT
TO PREVENT EVENTUAL LOOSENING OF THE NUTS.

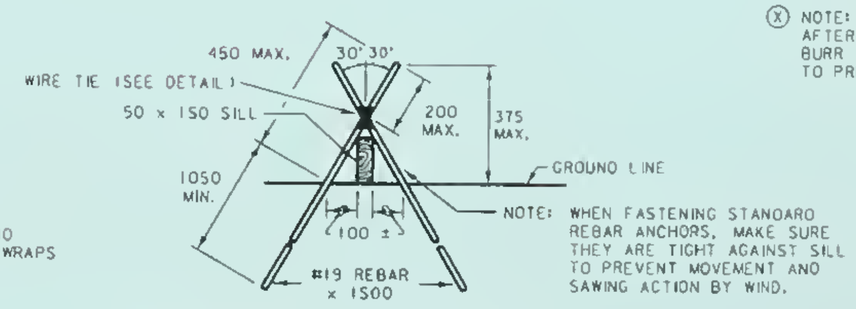
ANCHOR SYSTEM #1
(STANDARD)



STEP ①
WRAP FIRST 5 LAPS OF WIRE AROUND REBAR
EQUAL LENGTHS OF WIRE ON EITHER SIDE OF THE REBAR WHEN STARTING THE TIE.
TOP
STEP ②
FIRST 5 LAPS OF WIRE WRAPPED AROUND REBAR
WRAP SECOND 5 LAPS OF WIRE AROUND FIRST 5 LAPS
GROUND LINE
FRONT
STEP ③
TWIST TIE AND FOLD UNDER WRAPS
SIDE

WIRE TIE DETAIL

USE 12 GAGE OR HEAVIER GALVANIZED WIRE TO FORM THE WIRE TIES.



NOTE: WHEN FASTENING STANDARD REBAR ANCHORS, MAKE SURE THEY ARE TIGHT AGAINST SILL TO PREVENT MOVEMENT AND SAWING ACTION BY WIND.

USE TWO #19 REINFORCING BARS FOR EACH END OF EACH SILL MEMBER. DRIVE THE BARS UP TIGHT TO THE FRAME TO PREVENT SLIDING. TIE THE REINFORCING BARS AS SHOWN IN THE WIRE TIE DETAIL. THE PLACEMENT OF THE ANCHORS IS CRITICAL IN PREVENTING OVERTURNING AND SLIDING OF THE FENCE.

STANDARD ANCHOR DETAIL

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

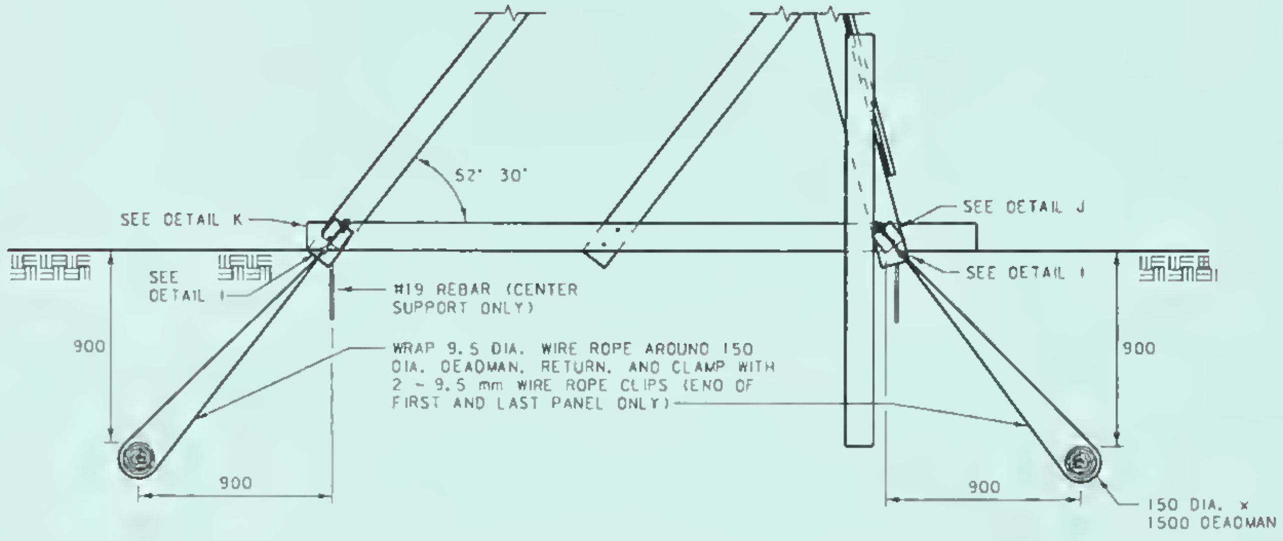
DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 607
DWG. NO.
607-40

WOOD SNOW FENCE
ANCHOR SYSTEM #3
AND #1 DETAILS

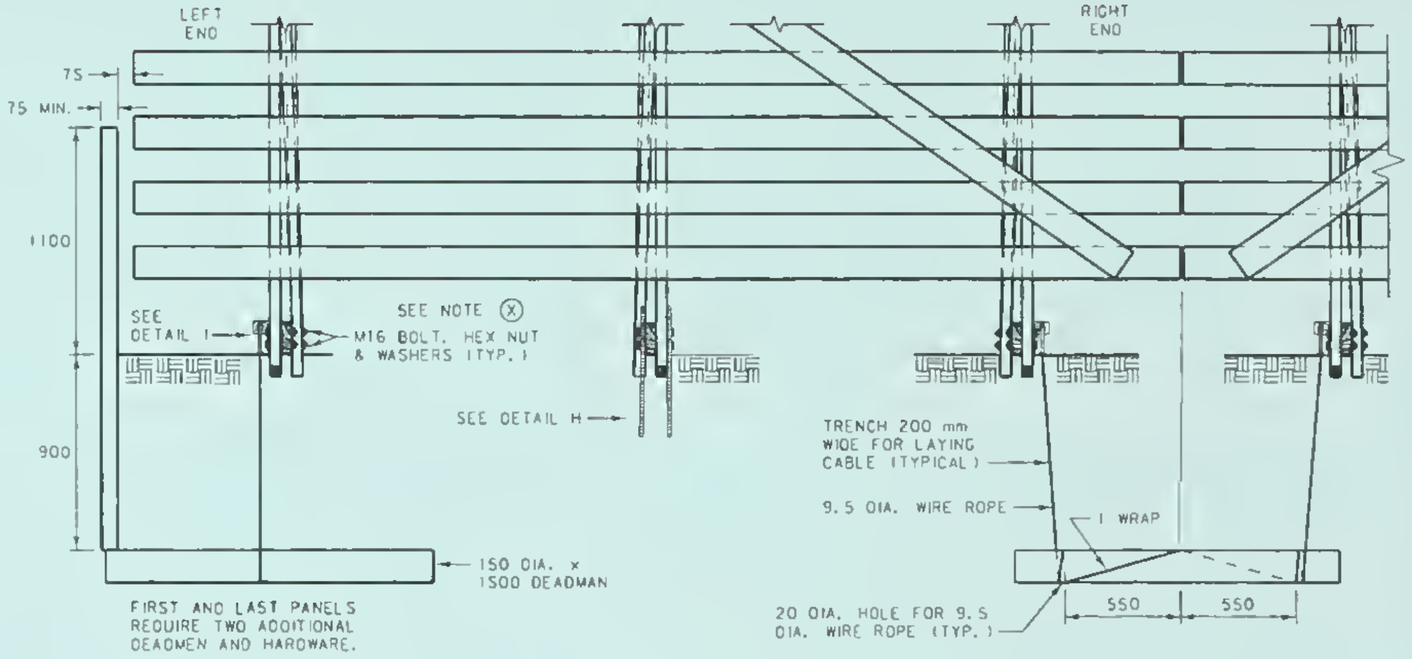
EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

ANCHOR SYSTEM #2
(FOR SWAMPY CONDITIONS)

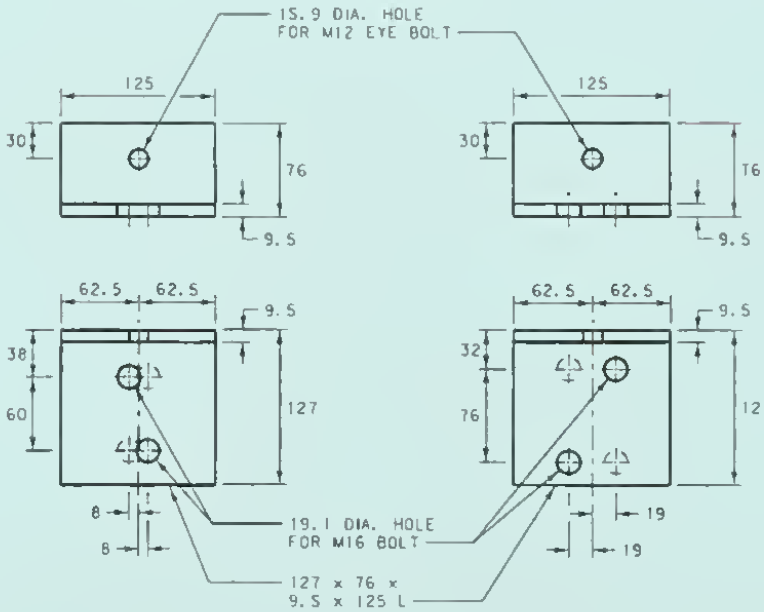

52° 30'
SEE DETAIL K
SEE DETAIL I
SEE DETAIL J
SEE DETAIL I
#19 REBAR (CENTER SUPPORT ONLY)
WRAP 9.5 DIA. WIRE ROPE AROUND 150 DIA. DEADMAN, RETURN, AND CLAMP WITH 2 ~ 9.5 mm WIRE ROPE CLIPS (END OF FIRST AND LAST PANEL ONLY)
900
900
900
900
150 DIA. × 1500 DEADMAN

LEFT END VIEW


LEFT END
RIGHT END
75
75 MIN.
1100
900
SEE DETAIL I
SEE NOTE ⓧ
M16 BOLT, HEX NUT & WASHERS (TYP.)
SEE DETAIL H
TRENCH 200 mm WIDE FOR LAYING CABLE (TYPICAL)
9.5 DIA. WIRE ROPE
1 WRAP
150 DIA. × 1500 DEADMAN
FIRST AND LAST PANELS REQUIRE TWO ADDITIONAL DEADMEN AND HARDWARE.
20 DIA. HOLE FOR 9.5 DIA. WIRE ROPE (TYP.)
550
550

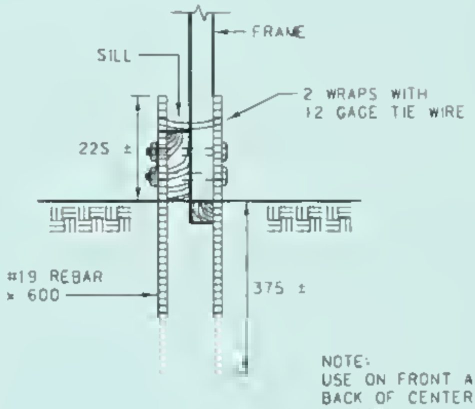
FRONT VIEW

NOTE:
HOLES SHOWN IN DETAILS BELOW ARE FOR LEFT END OF FENCE.
HOLES SHOWN HIDDEN ARE FOR RIGHT END OF FENCE.



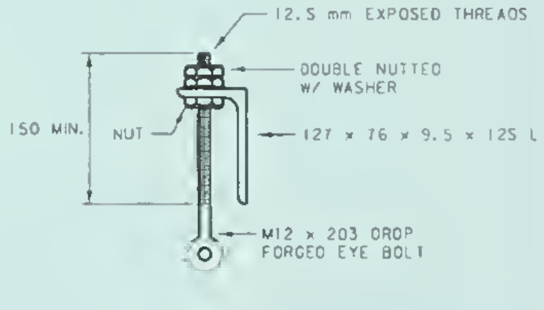
DETAIL J

DETAIL K

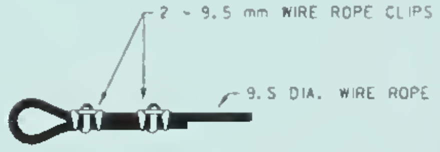


NOTE:
USE ON FRONT AND BACK OF CENTER SUPPORT.

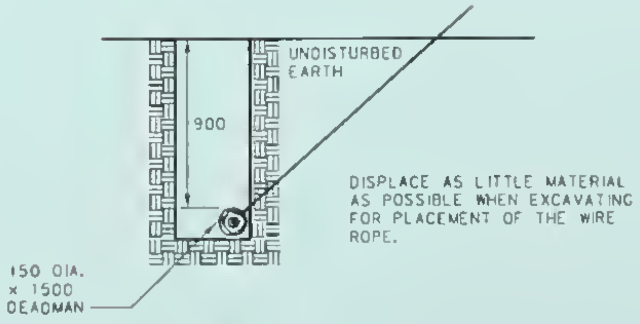
DETAIL H



DETAIL I



WIRE ROPE CONNECTION



DISPLACE AS LITTLE MATERIAL AS POSSIBLE WHEN EXCAVATING FOR PLACEMENT OF THE WIRE ROPE.

DEADMAN DETAIL

LUMBER - SNOW FENCE W/ ANCHOR SYSTEM #2
BILL OF MATERIALS FOR ONE PANEL
SAME AS FOR SNOW FENCE W/ ANCHOR SYSTEM #1

HARDWARE - SNOW FENCE W/ ANCHOR SYSTEM #2

BILL OF MATERIALS FOR ONE PANEL

QUANTITY	DESCRIPTION
4	127 × 76 × 9.5 × 127.0 L
8	9.5 mm WIRE CLAMPS
4	M12 DROP FORGED EYEBOLTS W/ 3 HEX NUTS
4	FLAT WASHERS FOR M12 EYEBOLTS
4	#19 REBAR × 600
4 PIECES	12 GAGE TIE WIRE × 600 ±
8500 mm	9.5 DIA. WIRE ROPE
2	150 DIA. × 1500 POST DEADMEN
30	M16 × 127 HEX BOLT (THREADED FULL LENGTH) AND NUT ← ⓧ
60	FLAT WASHERS FOR M16 BOLT

NOTE: NAILS REQUIRED ARE SAME AS SHOWN ON HARDWARE SUMMARY FOR SNOW FENCE W/ ANCHOR SYSTEM #1

ⓧ NOTE:
AFTER M16 BOLTS HAVE BEEN TIGHTENED, BURR THE THREAD DIRECTLY BEHIND THE NUT TO PREVENT EVENTUAL LOOSENING OF THE NUTS.

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 607
DWG. NO.
607-45

WOOD SNOW FENCE
ANCHOR SYSTEM #2 DETAILS

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

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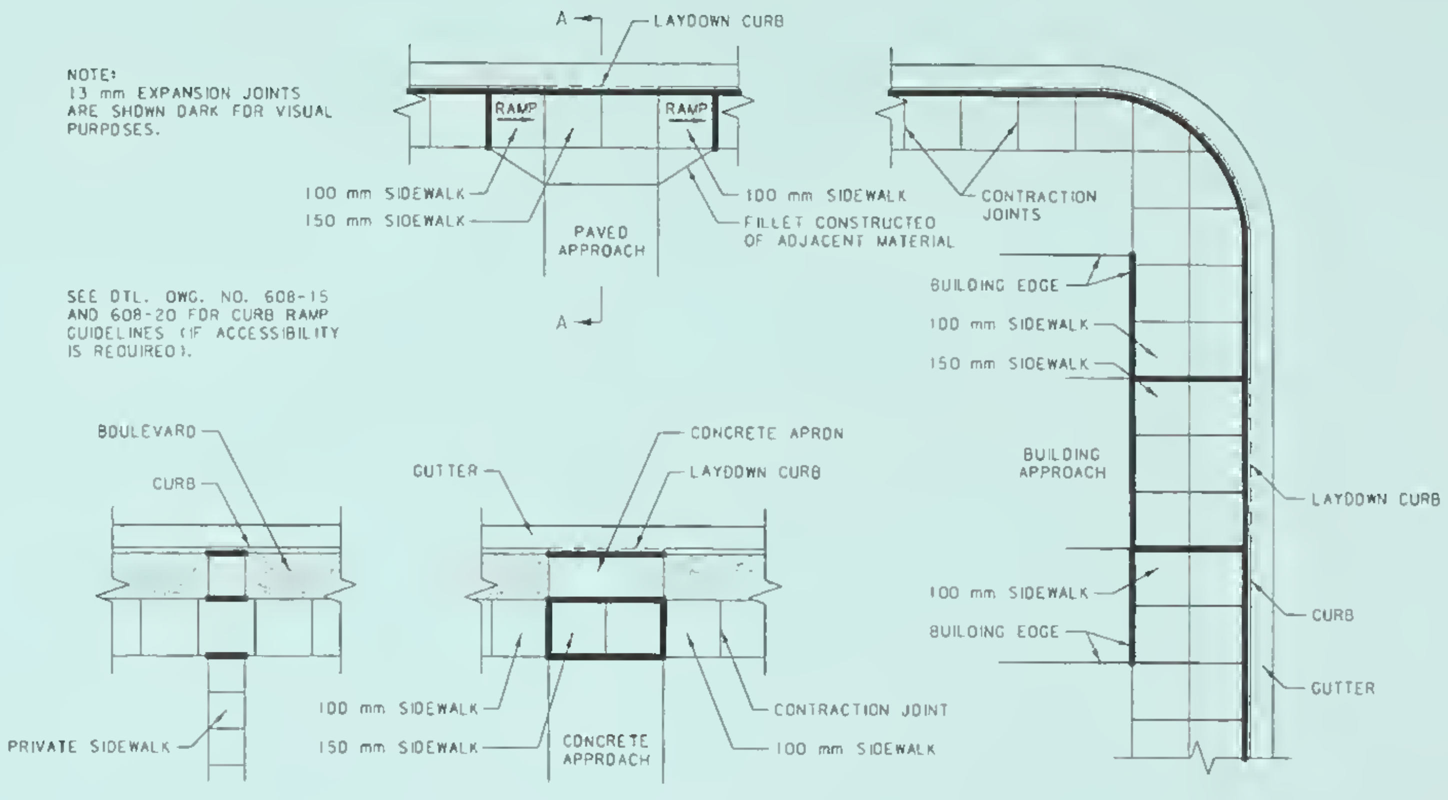
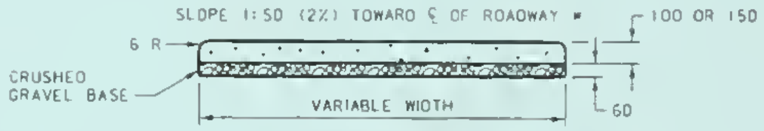


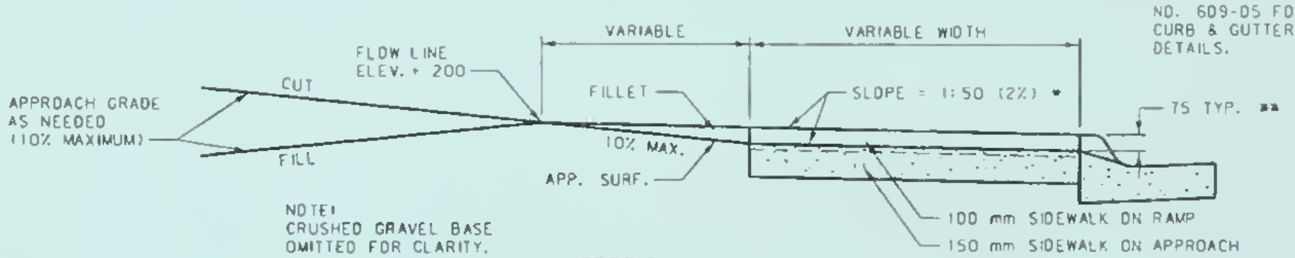
NOTE:
13 mm EXPANSION JOINTS ARE SHOWN DARK FOR VISUAL PURPOSES.

SEE DTL. DWG. NO. 608-15 AND 608-20 FOR CURB RAMP GUIDELINES (IF ACCESSIBILITY IS REQUIRED).

PLAN



SECTION OF SIDEWALK



NOTE:
SEE DTL. DWG. NO. 609-05 FOR CURB & GUTTER DETAILS.

NOTE:
CRUSHED GRAVEL BASE OMITTED FOR CLARITY.

SECTION A-A

NOTES:

INSTALL PREFORMED EXPANSION JOINT FILLER, STD. SPEC. 707.01.3, AT ALL EXPANSION JOINTS, FOR THE FULL THICKNESS OF THE SIDEWALK AND USE AT ALL JOINTS BETWEEN NEW CONCRETE SIDEWALK AND STRUCTURES IN PLACE.

ALL JOINTS MUST BE STRAIGHT AND PERPENDICULAR TO THE CENTERLINE AND THE SURFACE OF THE SIDEWALK. WHERE PRACTICABLE, ALIGN ALL JOINTS WITH LIKE JOINTS IN ADJOINING WORK. USE JOINTS TO OUTLINE ALL PANELS IN THE SIDEWALK, WHICH ARE TO BE, SO FAR AS POSSIBLE, SQUARE. THE LENGTHS OF THE PANELS ARE DETERMINED BY THE WIDTH OF THE SIDEWALK.

WHERE RIGHT-OF-WAY PERMITS, NEW SIDEWALKS LESS THAN 1525 mm IN WIDTH MUST HAVE A PASSING AREA AT A MAXIMUM SPACING OF 61 m. THE PASSING AREA IS A MINIMUM OF 1525 mm BY 1525 mm IN SIZE.

CONTRACTION JOINTS MAY NOT BE MORE THAN 3 mm WIDE AND NOT LESS THAN 25 mm IN DEPTH AND MAY BE CUT BY A GROOVE FORMING TOOL.

LOCATE EXPANSION JOINTS AT INTERVALS EQUAL TO THE NEAREST MULTIPLE OF THE CONTRACTION JOINT INTERVAL, BUT NOT GREATER THAN 18.3 METERS.

USE A LONGITUDINAL CONTRACTION JOINT IN THE CENTERLINE OF ALL SIDEWALKS WIDER THAN 1525 mm.

* THE MAXIMUM CROSS SLOPE OF THE SIDEWALK IS 1:50 (2%).

** THIS DEPTH IS STANDARD IN NEW CONSTRUCTION. ALTERATIONS TO EXISTING FACILITIES MAY RESULT IN A LARGER DEPTH, WHICH WILL REQUIRE A GREATER RAMP LENGTH.

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 608
DWG. NO.
608-05

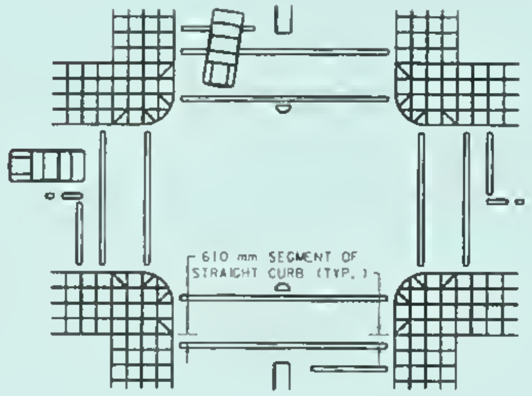
CONCRETE SIDEWALK

EFFECTIVE: AUGUST 1999

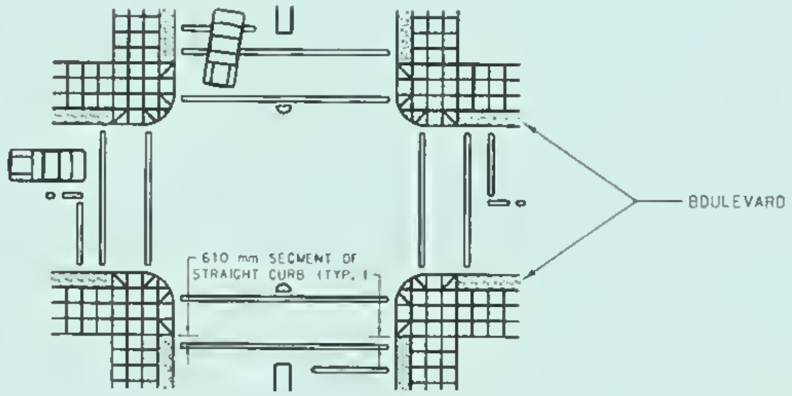
MDT *MONTANA DEPARTMENT OF TRANSPORTATION*
MONTANA CADD

CURB RAMPS AT MARKED CROSSINGS

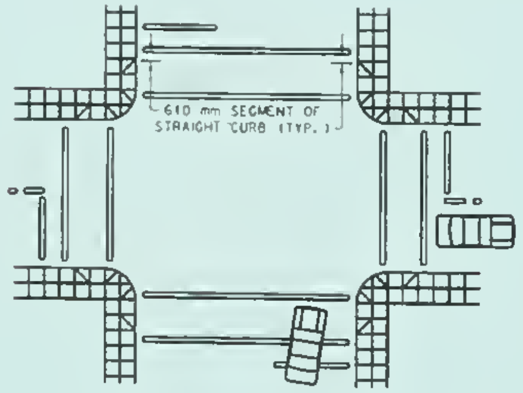
ILLUSTRATED WITH OPTION A (SEE NOTE 1)



TYPICAL URBAN SITE - WIDE SIDEWALKS WITH MEDIAN ISLANDS DEPRESSED.

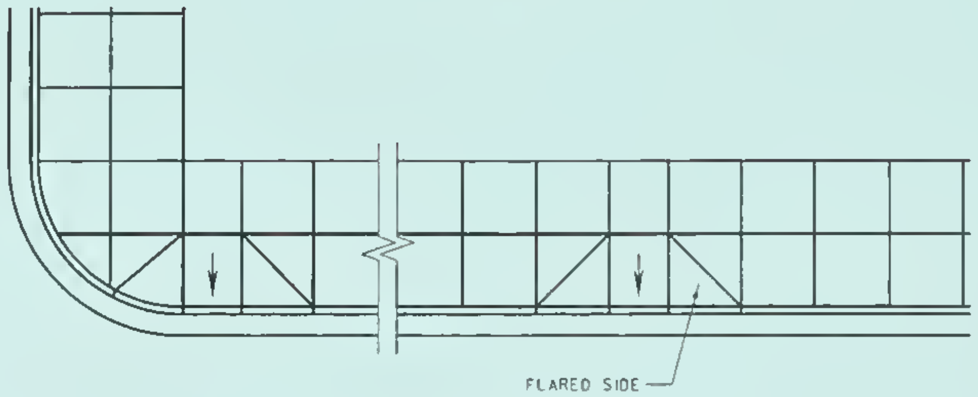


TYPICAL URBAN SITE - WIDE SIDEWALKS WITH MEDIAN ISLANDS DEPRESSED (INCLUDES BOULEVARD AREA)



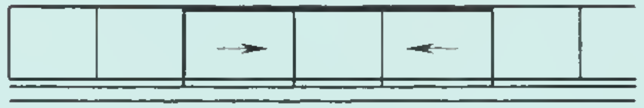
TYPICAL RESIDENTIAL SITE - NARROWER SIDEWALKS (MAY INCLUDE BOULEVARD - NOT SHOWN)

CURB RAMP TYPES



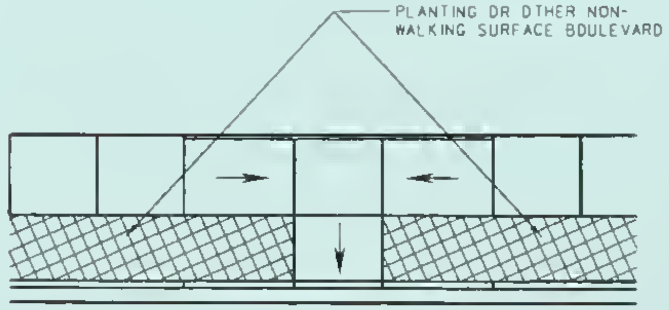
(A)

PERPENDICULAR PUBLIC SIDEWALK CURB RAMP (SEE DETAILED DRAWING NUMBER 608-25 FOR ADDITIONAL DETAILS)



(B)

PARALLEL PUBLIC SIDEWALK CURB RAMP (SEE DETAILED DRAWING NUMBER 608-30 FOR ADDITIONAL DETAILS)



(C)

COMBINED (PARALLEL/PERPENDICULAR) PUBLIC SIDEWALK CURB RAMP (SEE DETAILED DRAWING NUMBERS 608-25 AND 608-30 FOR ADDITIONAL DETAILS)

GENERAL NOTES:

1. IN NEW CONSTRUCTION, USE PUBLIC SIDEWALK CURB RAMPS IN THE FOLLOWING ORDER OF PREFERENCE:

   A. PERPENDICULAR PUBLIC SIDEWALK CURB RAMP
   B. PARALLEL PUBLIC SIDEWALK CURB RAMP
   C. COMBINED (PARALLEL/PERPENDICULAR) PUBLIC SIDEWALK CURB RAMP
   D. DIAGONAL PUBLIC SIDEWALK CURB RAMP.

   SINGLE DIAGONAL OR DEPRESSED CORNER PUBLIC SIDEWALK CURB RAMPS SERVING TWO STREET CROSSING DIRECTIONS ARE NOT PERMITTED IN NEW CONSTRUCTION.

2. WHEN ALTERING EXISTING FACILITIES, MEET NEW CONSTRUCTION REQUIREMENTS FOR PUBLIC SIDEWALK CURB RAMPS TO THE MAXIMUM EXTENT FEASIBLE.

3. IF POSSIBLE, DO NOT PLACE DRAINAGE STRUCTURES IN CONFLICT WITH PUBLIC SIDEWALK CURB RAMPS. LOCATION OF CURB RAMPS TAKES PRECEDENCE OVER LOCATION OF DRAINAGE STRUCTURES EXCEPT WHERE EXISTING DRAINAGE STRUCTURES ARE BEING UTILIZED.

4. USE THE FLATTEST SLOPES POSSIBLE FOR ALL CURB RAMPS. MAXIMUM SLOPES ARE SHOWN FOR GUIDANCE AT DIFFICULT SITES.

5. FINAL FIELD LOCATION OF THE CURB RAMPS WILL BE DETERMINED BY THE ENGINEER.

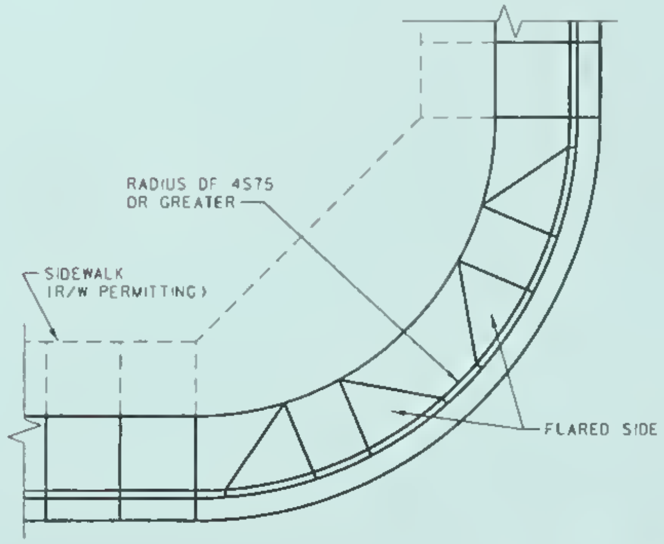
6. FOR ADDITIONAL INFORMATION CONSULT:

   APPENDIX IV
   AMERICANS WITH DISABILITIES ACT (ADA)
   ACCESSIBILITY GUIDELINES FOR BUILDINGS AND FACILITIES
   AUGUST 1994 EDITION

CONSTRUCTION REQUIREMENTS:

1. OBTAIN A SURFACE TEXTURE ON THE RAMP BY COARSE BROOMING, TRANSVERSE TO THE RAMP SLOPE.

2. TAKE CARE DURING CONSTRUCTION TO ASSURE UNIFORM RAMP GRADES, FREE OF SAGS AND SHARP GRADE CHANGES.



(D)

DIAGONAL PUBLIC SIDEWALK CURB RAMP (SEE DETAILED DRAWING NUMBER 608-35 FOR ADDITIONAL DETAILS)

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 608
DWG. NO.
608-15

NEW CONSTRUCTION
PUBLIC SIDEWALK
CURB RAMPS

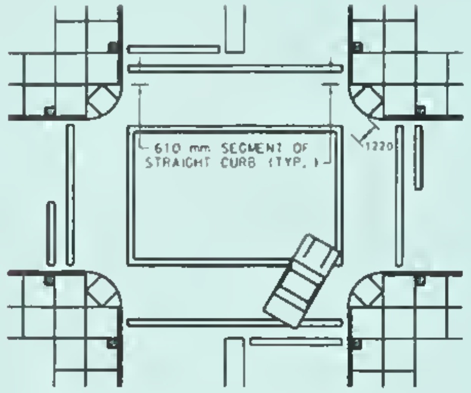
EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

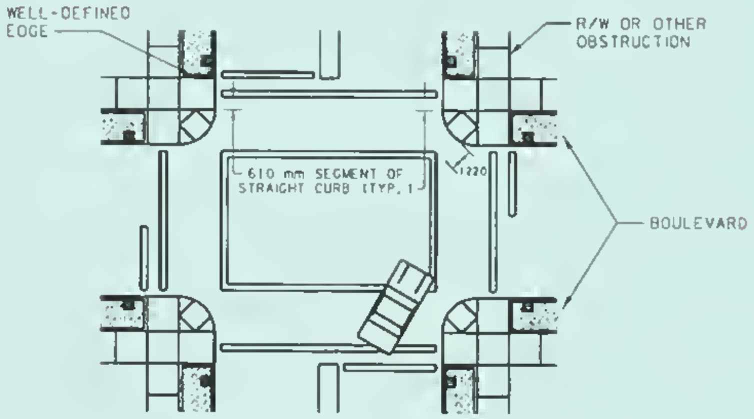
CURB RAMPS AT MARKED INTERSECTIONS

ILLUSTRATED WITH OPTION E (SEE NOTE 1)

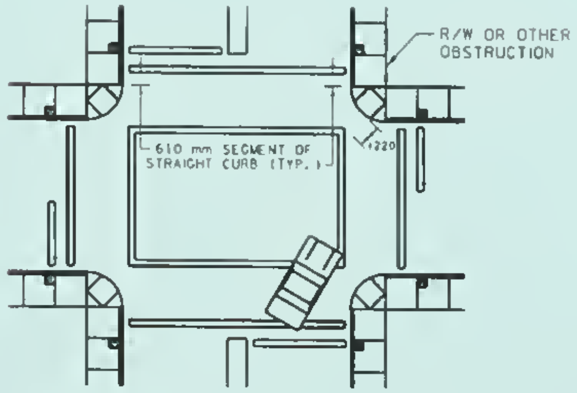
FOLLOW NEW CONSTRUCTION GUIDELINES ON DETAILED DRAWING NUMBER 608-15 UNLESS EXISTING OBSTRUCTIONS CAUSE USE OF THE DIAGONAL PUBLIC SIDEWALK CURB RAMP.



TYPICAL URBAN SITE - EXISTING OBSTRUCTIONS PREVENT USE OF OTHER CURB RAMP TYPES



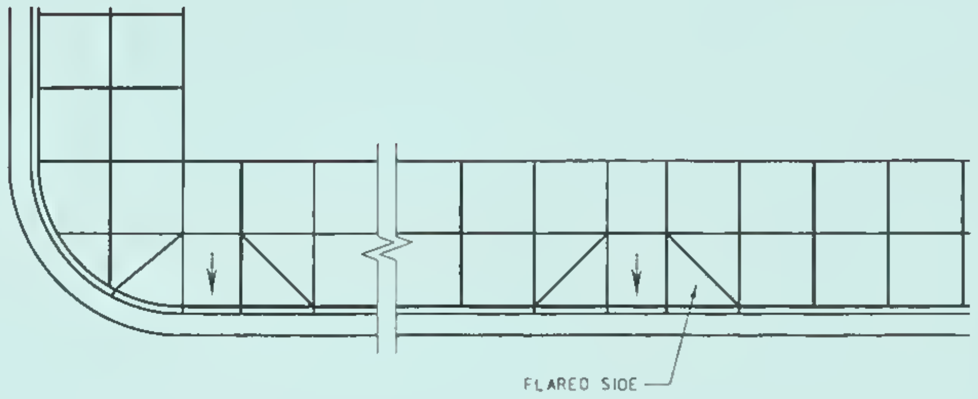
TYPICAL SITE - EXISTING RIGHT-OF-WAY OR OTHER OBSTRUCTIONS PREVENT USE OF OTHER CURB RAMP TYPES (SHOWN WITH BOULEVARD)



TYPICAL SITE - EXISTING RIGHT-OF-WAY OR OTHER OBSTRUCTIONS PREVENT USE OF OTHER CURB RAMP TYPES

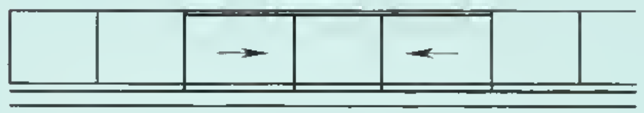
▪ - OBSTRUCTION

CURB RAMP TYPES



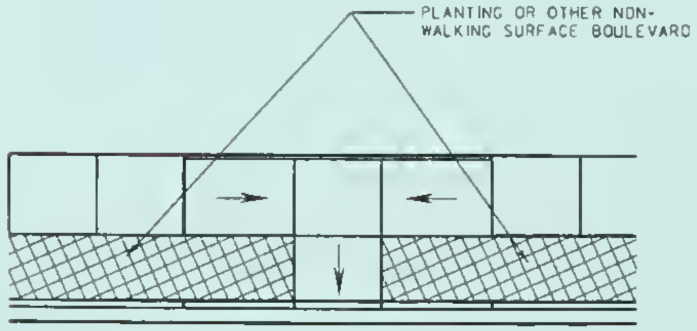
(A)

PERPENDICULAR PUBLIC SIDEWALK CURB RAMP (SEE DETAILED DRAWING NUMBER 608-25 FOR ADDITIONAL DETAILS)



(B)

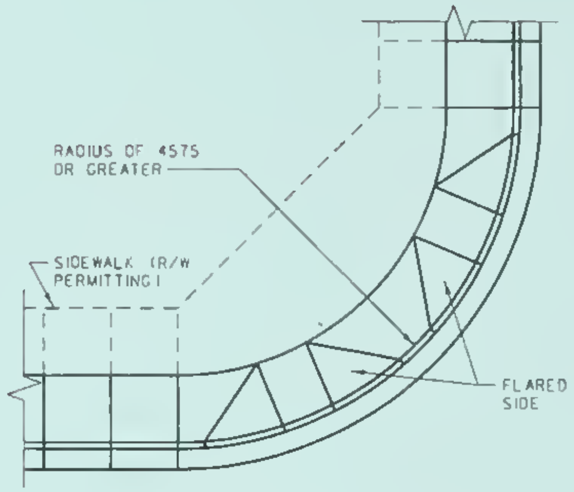
PARALLEL PUBLIC SIDEWALK CURB RAMP (SEE DETAILED DRAWING NUMBER 608-30 FOR ADDITIONAL DETAILS)



(C)

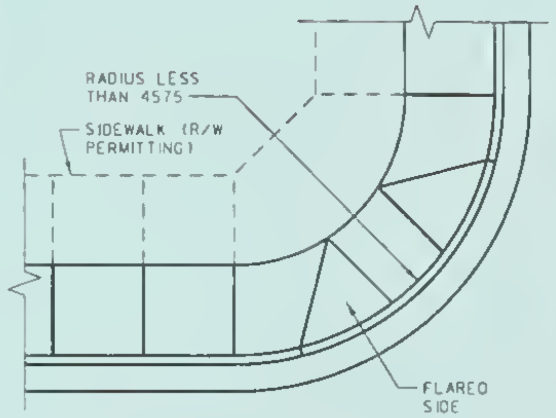
COMBINED (PARALLEL/PERPENDICULAR) PUBLIC SIDEWALK CURB RAMP (SEE DETAILED DRAWING NUMBERS 608-25 AND 608-30 FOR ADDITIONAL DETAILS)

CURB RAMP TYPES



(D)

DIAGONAL PUBLIC SIDEWALK CURB RAMP (SEE DETAILED DRAWING NUMBER 608-35 FOR ADDITIONAL DETAILS)



(E)

SINGLE DIAGONAL PUBLIC SIDEWALK CURB RAMP (SEE DETAILED DRAWING NUMBER 608-35 FOR ADDITIONAL DETAILS)

GENERAL NOTES:

1. WHEN ALTERING EXISTING FACILITIES, USE PUBLIC SIDEWALK CURB RAMPS IN THE FOLLOWING ORDER OF PREFERENCE:

   A. PERPENDICULAR PUBLIC SIDEWALK CURB RAMP
   B. PARALLEL PUBLIC SIDEWALK CURB RAMP
   C. COMBINED (PARALLEL/PERPENDICULAR) PUBLIC SIDWALK CURB RAMP
   D. DIAGONAL PUBLIC SIDEWALK CURB RAMP
   E. SINGLE DIAGONAL PUBLIC SIDEWALK CURB RAMP

   NOTE: USE DIAGONAL PUBLIC SIDEWALK CURB RAMPS AS THE LAST OPTION AND CONSTRUCT TO COMPLY WITH ALL ADA SLOPE AND CONSTRUCTION CRITERIA TO THE GREATEST EXTENT POSSIBLE.

2. PLACE CURB RAMPS TO AVOID EXISTING DRAINAGE STRUCTURES AND OTHER OBSTRUCTIONS TO THE GREATEST EXTENT POSSIBLE.

3. USE THE FLATTEST SLOPES POSSIBLE FOR ALL CURB RAMPS. MAXIMUM SLOPES ARE SHOWN FOR GUIDANCE AT DIFFICULT SITES AND SHOULD BE AVOIDED IF POSSIBLE.

4. FINAL FIELD LOCATION OF THE CURB RAMPS WILL BE DETERMINED BY THE ENGINEER.

5. FOR ADDITIONAL INFORMATION CONSULT:

   APPENDIX IV
   AMERICANS WITH DISABILITIES ACT (ADA)
   ACCESSIBILITY GUIDELINES FOR BUILDINGS AND FACILITIES
   AUGUST, 1994 EDITION

CONSTRUCTION REQUIREMENTS:

1. OBTAIN A SURFACE TEXTURE ON THE RAMP BY COARSE BROOMING, TRANSVERSE TO THE RAMP SLOPE.

2. TAKE CARE DURING CONSTRUCTION TO ASSURE UNIFORM RAMP GRADES, FREE OF SAGS AND SHARP GRADE CHANGES.

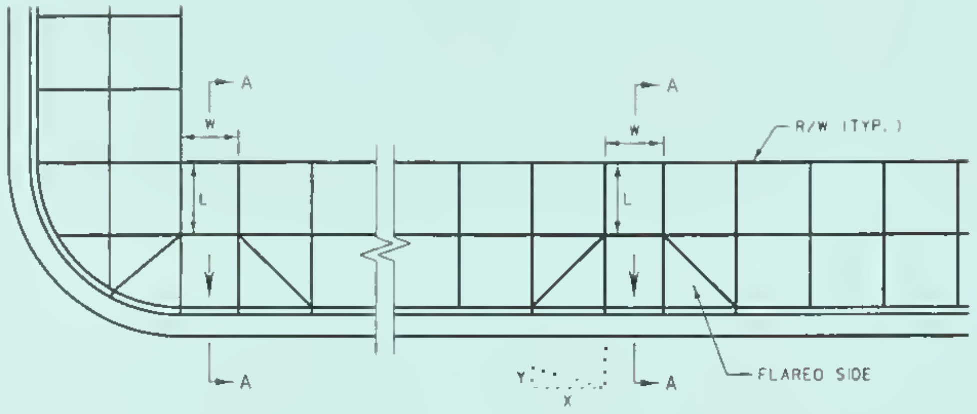
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 608
DWG. NO.
608-20

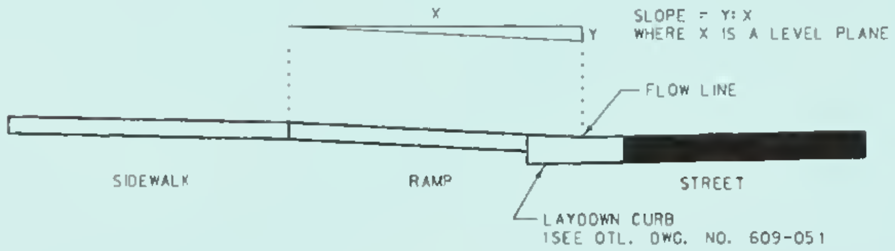
ALTERATIONS TO EXISTING
FACILITIES - PUBLIC
SIDEWALK CURB RAMPS

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



PERPENDICULAR PUBLIC SIDEWALK CURB RAMP



SECTION A-A

NEW CONSTRUCTION REQUIREMENTS:

1. THE DESIRABLE WIDTH OF THE CURB RAMP (DIMENSION "W" ABOVE) IS 1220 mm OR WIDER. THE MINIMUM WIDTH (W) IS 915 mm.
2. THE DESIRABLE LENGTH OF THE LANDING AT THE TOP OF THE CURB RAMP (DIMENSION "L" ABOVE) IS 1525 mm OR THE LENGTH OF THE RAMP. THE MINIMUM LENGTH "L" IS 1220 mm.
3. THE DESIRABLE SLOPE FOR THE CURB RAMP IS 1:20 OR FLATTER. THE MAXIMUM CURB RAMP SLOPE IS 1:12.
4. THE DESIRABLE SLOPE FOR THE FLARED SIDE OF THE CURB RAMP IS 1:12 OR FLATTER. THE MAXIMUM FLARED SIDE SLOPE IS 1:10.
5. THE MAXIMUM CROSS SLOPE OF THE SIDEWALK IS 1:50 (2%).
6. THE SURFACE OF THE PERPENDICULAR PUBLIC SIDEWALK CURB RAMP IS TO CONTRAST VISUALLY WITH THE ADJOINING PUBLIC SIDEWALK SURFACES. THIS CAN BE OBTAINED BY USE OF COLORED CONCRETE, PATTERNING THE CONCRETE SURFACE OR OTHER APPROVED METHODS.

REQUIREMENTS FOR ALTERATIONS TO EXISTING FACILITIES:

NOTE: WHEREVER POSSIBLE, ALTER EXISTING FACILITIES TO COMPLY WITH THE NEW CONSTRUCTION REQUIREMENTS.

1. THE MINIMUM WIDTH OF THE CURB RAMP (DIMENSION "W" ABOVE) IS 915 mm.
   NOTE: WHERE THE PUBLIC PEDESTRIAN RIGHT-OF-WAY WIDTH IS LESS THAN 915 mm, PROVIDE A PARALLEL PUBLIC SIDEWALK CURB RAMP.
2. WHERE PUBLIC PEDESTRIAN RIGHT-OF-WAY WIDTH IS INSUFFICIENT TO ACCOMMODATE A TOP LANDING OF 1220 mm, PROVIDE A TOP LANDING OF 915 mm.
3. THE MAXIMUM CURB RAMP SLOPE IS 1:10, PROVIDED THE RISE (DIMENSION "Y" ABOVE) IS 150 mm OR LESS. A 1:12 OR FLATTER SLOPE IS DESIRABLE.
4. THE MAXIMUM FLARED SIDE SLOPE IS 1:10.
5. THE MAXIMUM CROSS SLOPE OF THE SIDEWALK IS 1:50 (2%).
6. THE SURFACE OF THE PERPENDICULAR PUBLIC SIDEWALK CURB RAMP IS TO CONTRAST VISUALLY WITH THE ADJOINING PUBLIC SIDEWALK SURFACES. THIS CAN BE OBTAINED BY USE OF COLORED CONCRETE, PATTERNING THE CONCRETE SURFACE OR OTHER APPROVED METHODS.
7. WHERE EXISTING SITE DEVELOPMENT CONDITIONS PROHIBIT THE STRICT AND FULL COMPLIANCE OF ALL ADA CRITERIA, PROVIDE ACCESSIBILITY TO THE MAXIMUM EXTENT FEASIBLE.

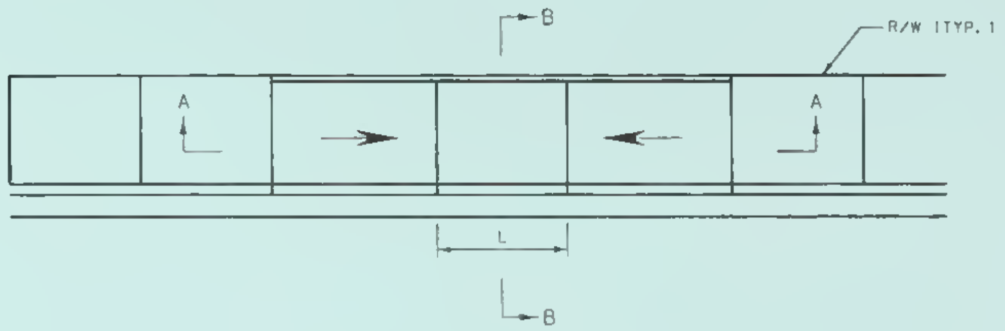
NOTE:
COMBINED (PARALLEL/PERPENDICULAR) PUBLIC SIDEWALK CURB RAMPS ARE TO MEET THE CRITERIA FOR BOTH THE PARALLEL AND PERPENDICULAR PUBLIC SIDEWALK CURB RAMPS. (SEE DETAILED DRAWING NUMBER 608-30 AND THIS DRAWING.)

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 608
DWG. NO.
608-25

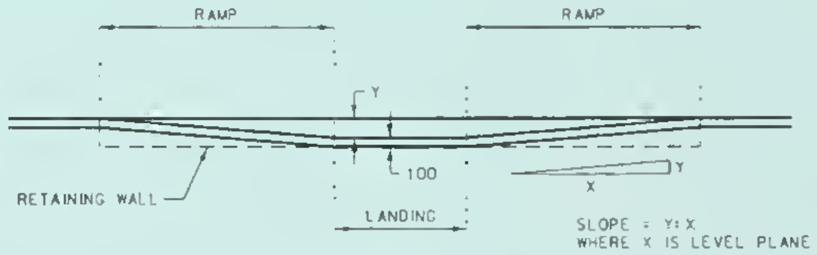
PERPENDICULAR
PUBLIC SIDEWALK
CURB RAMPS

EFFECTIVE: AUGUST 1999

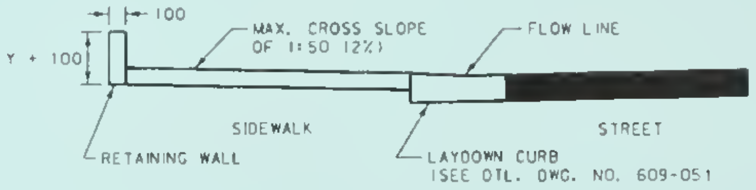
MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



PARALLEL PUBLIC SIDEWALK CURB RAMP



SECTION A-A



SECTION B-B

NEW CONSTRUCTION REQUIREMENTS:

1. THE MINIMUM LENGTH OF THE LANDING (DIMENSION "L" ABOVE) IS 1525 mm.
2. THE DESIRABLE SLOPE FOR THE CURB RAMPS IS 1:20 OR FLATTER. THE MAXIMUM CURB RAMP SLOPE IS 1:12.
3. THE MAXIMUM CROSS SLOPE OF THE SIDEWALK OR LANDING IS 1:50 (2%).
4. THE SURFACE OF THE LANDING IS TO CONTRAST VISUALLY WITH ADJOINING PUBLIC SIDEWALK SURFACES. THIS CAN BE OBTAINED BY USE OF COLORED CONCRETE, PATTERNING THE CONCRETE SURFACE OR OTHER APPROVED METHODS.

REQUIREMENTS FOR ALTERATIONS TO EXISTING FACILITIES:

NOTE: WHEREVER POSSIBLE, ALTER EXISTING FACILITIES TO COMPLY WITH THE NEW CONSTRUCTION REQUIREMENTS.

1. THE DESIRABLE LENGTH OF THE LANDING (DIMENSION "L" ABOVE) IS 1525 mm. THE MINIMUM LANDING LENGTH IS 1220 mm.
2. THE MAXIMUM CURB RAMP SLOPE IS 1:10, PROVIDED THE RISE (DIMENSION "Y" ABOVE) IS 150 mm OR LESS. A 1:12 OR FLATTER SLOPE IS DESIRABLE.
3. THE MAXIMUM CROSS SLOPE OF THE SIDEWALK AND LANDING IS 1:50 (2%) SLOPE.
4. THE SURFACE OF THE LANDING IS TO CONTRAST VISUALLY WITH THE ADJOINING PUBLIC SIDEWALK SURFACES. THIS CAN BE OBTAINED BY USE OF COLORED CONCRETE, PATTERNING THE CONCRETE SURFACE OR OTHER APPROVED METHODS.
5. WHERE EXISTING SITE DEVELOPMENT CONDITIONS PROHIBIT THE STRICT AND FULL COMPLIANCE OF ALL ADA CRITERIA, PROVIDE ACCESSIBILITY TO THE MAXIMUM EXTENT FEASIBLE.

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

NOTES:

THE COST OF THE RETAINING WALL IS INCLUDED IN THE UNIT PRICE BID FOR CONCRETE SIDEWALK.

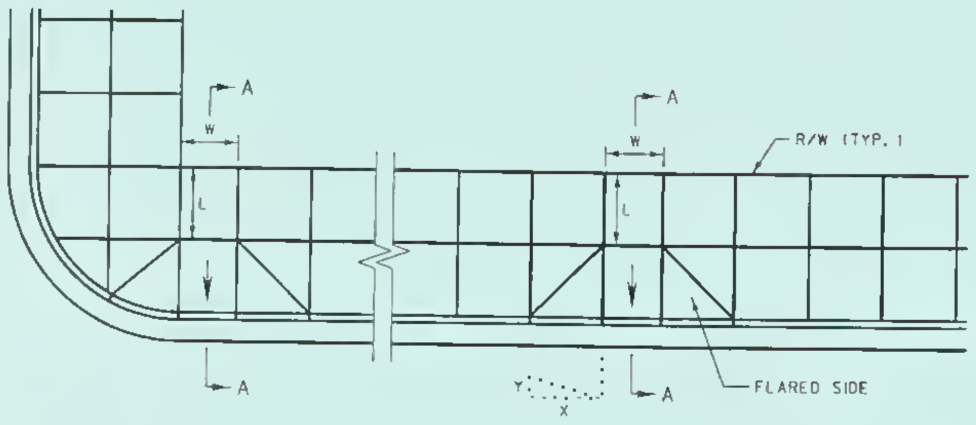
COMBINED (PARALLEL/PERPENDICULAR) PUBLIC SIDEWALK CURB RAMPS ARE TO MEET THE CRITERIA FOR BOTH THE PARALLEL AND PERPENDICULAR PUBLIC SIDEWALK CURB RAMPS. (SEE DETAILED DRAWING NO. 608-25 AND THIS DRAWING.)

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 608
DWG. NO.
608-30

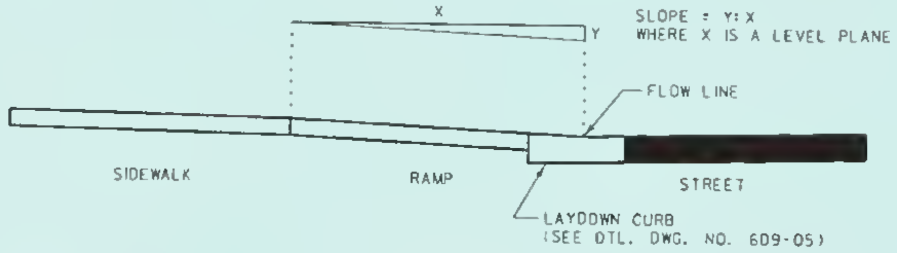
PARALLEL
PUBLIC SIDEWALK
CURB RAMPS

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



PERPENDICULAR PUBLIC SIDEWALK CURB RAMP



SECTION A-A

NEW CONSTRUCTION REQUIREMENTS:

1. THE DESIRABLE WIDTH OF THE CURB RAMP (DIMENSION "W" ABOVE) IS 1220 mm OR WIDER. THE MINIMUM WIDTH (W) IS 915 mm.
2. THE DESIRABLE LENGTH OF THE LANDING AT THE TOP OF THE CURB RAMP (DIMENSION "L" ABOVE) IS 1525 mm OR THE LENGTH OF THE RAMP. THE MINIMUM LENGTH "L" IS 1220 mm.
3. THE DESIRABLE SLOPE FOR THE CURB RAMP IS 1:20 OR FLATTER. THE MAXIMUM CURB RAMP SLOPE IS 1:12.
4. THE DESIRABLE SLOPE FOR THE FLARED SIDE OF THE CURB RAMP IS 1:12 OR FLATTER. THE MAXIMUM FLARED SIDE SLOPE IS 1:10.
5. THE MAXIMUM CROSS SLOPE OF THE SIDEWALK IS 1:50 (2%).
6. THE SURFACE OF THE PERPENDICULAR PUBLIC SIDEWALK CURB RAMP IS TO CONTRAST VISUALLY WITH THE ADJOINING PUBLIC SIDEWALK SURFACES. THIS CAN BE OBTAINED BY USE OF COLORED CONCRETE, PATTERNING THE CONCRETE SURFACE OR OTHER APPROVED METHODS.

REQUIREMENTS FOR ALTERATIONS TO EXISTING FACILITIES:

NOTE: WHEREVER POSSIBLE, ALTER EXISTING FACILITIES TO COMPLY WITH THE NEW CONSTRUCTION REQUIREMENTS.

1. THE MINIMUM WIDTH OF THE CURB RAMP (DIMENSION "W" ABOVE) IS 915 mm.
   NOTE: WHERE THE PUBLIC PEDESTRIAN RIGHT-OF-WAY WIDTH IS LESS THAN 915 mm, PROVIDE A PARALLEL PUBLIC SIDEWALK CURB RAMP.
2. WHERE PUBLIC PEDESTRIAN RIGHT-OF-WAY WIDTH IS INSUFFICIENT TO ACCOMMODATE A TOP LANDING OF 1220 mm, PROVIDE A TOP LANDING OF 915 mm.
3. THE MAXIMUM CURB RAMP SLOPE IS 1:10, PROVIDED THE RISE (DIMENSION "Y" ABOVE) IS 150 mm OR LESS. A 1:12 OR FLATTER SLOPE IS DESIRABLE.
4. THE MAXIMUM FLARED SIDE SLOPE IS 1:10.
5. THE MAXIMUM CROSS SLOPE OF THE SIDEWALK IS 1:50 (2%).
6. THE SURFACE OF THE PERPENDICULAR PUBLIC SIDEWALK CURB RAMP IS TO CONTRAST VISUALLY WITH THE ADJOINING PUBLIC SIDEWALK SURFACES. THIS CAN BE OBTAINED BY USE OF COLORED CONCRETE, PATTERNING THE CONCRETE SURFACE OR OTHER APPROVED METHODS.
7. WHERE EXISTING SITE DEVELOPMENT CONDITIONS PROHIBIT THE STRICT AND FULL COMPLIANCE OF ALL ADA CRITERIA, PROVIDE ACCESSIBILITY TO THE MAXIMUM EXTENT FEASIBLE.

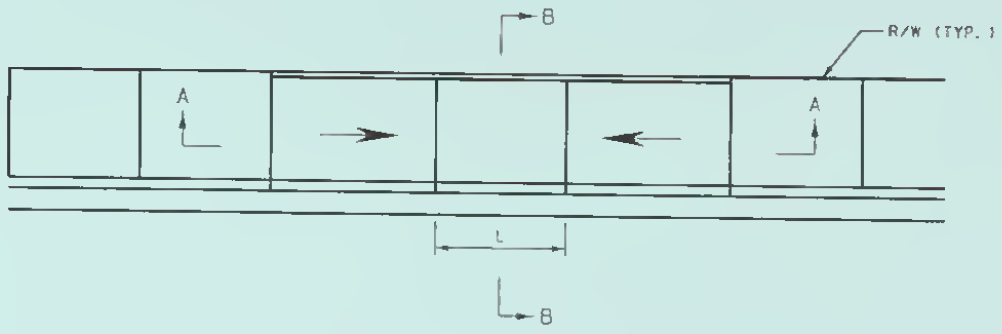
NOTE:
COMBINED (PARALLEL/PERPENDICULAR) PUBLIC SIDEWALK CURB RAMPS ARE TO MEET THE CRITERIA FOR BOTH THE PARALLEL AND PERPENDICULAR PUBLIC SIDEWALK CURB RAMPS. (SEE DETAILED DRAWING NUMBER 608-30 AND THIS DRAWING.)

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 608
DWG. NO.
608-25

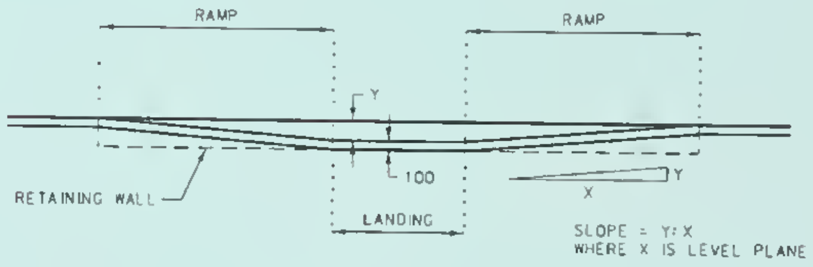
PERPENDICULAR
PUBLIC SIDEWALK
CURB RAMPS

EFFECTIVE: AUGUST 1999

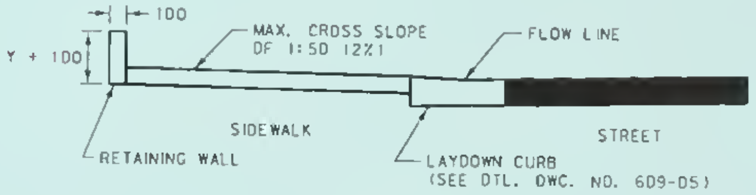
MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



PARALLEL PUBLIC SIDEWALK CURB RAMP



SECTION A-A



SECTION B-B

NEW CONSTRUCTION REQUIREMENTS:

1. THE MINIMUM LENGTH OF THE LANDING (DIMENSION "L" ABOVE) IS 1525 mm.
2. THE DESIRABLE SLOPE FOR THE CURB RAMPS IS 1:20 OR FLATTER. THE MAXIMUM CURB RAMP SLOPE IS 1:12.
3. THE MAXIMUM CROSS SLOPE OF THE SIDEWALK OR LANDING IS 1:50 (2%).
4. THE SURFACE OF THE LANDING IS TO CONTRAST VISUALLY WITH ADJOINING PUBLIC SIDEWALK SURFACES. THIS CAN BE OBTAINED BY USE OF COLORED CONCRETE, PATTERNING THE CONCRETE SURFACE OR OTHER APPROVED METHODS.

REQUIREMENTS FOR ALTERATIONS TO EXISTING FACILITIES:

NOTE: WHEREVER POSSIBLE, ALTER EXISTING FACILITIES TO COMPLY WITH THE NEW CONSTRUCTION REQUIREMENTS.

1. THE DESIRABLE LENGTH OF THE LANDING (DIMENSION "L" ABOVE) IS 1525 mm. THE MINIMUM LANDING LENGTH IS 1220 mm.
2. THE MAXIMUM CURB RAMP SLOPE IS 1:10, PROVIDED THE RISE (DIMENSION "Y" ABOVE) IS 150 mm OR LESS. A 1:12 OR FLATTER SLOPE IS DESIRABLE.
3. THE MAXIMUM CROSS SLOPE OF THE SIDEWALK AND LANDING IS 1:50 (2%) SLOPE.
4. THE SURFACE OF THE LANDING IS TO CONTRAST VISUALLY WITH THE ADJOINING PUBLIC SIDEWALK SURFACES. THIS CAN BE OBTAINED BY USE OF COLORED CONCRETE, PATTERNING THE CONCRETE SURFACE OR OTHER APPROVED METHODS.
5. WHERE EXISTING SITE DEVELOPMENT CONDITIONS PROHIBIT THE STRICT AND FULL COMPLIANCE OF ALL ADA CRITERIA, PROVIDE ACCESSIBILITY TO THE MAXIMUM EXTENT FEASIBLE.

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

NOTES:

THE COST OF THE RETAINING WALL IS INCLUDED IN THE UNIT PRICE BID FOR CONCRETE SIDEWALK.

COMBINED (PARALLEL/PERPENDICULAR) PUBLIC SIDEWALK CURB RAMPS ARE TO MEET THE CRITERIA FOR BOTH THE PARALLEL AND PERPENDICULAR PUBLIC SIDEWALK CURB RAMPS. (SEE DETAILED DRAWING NO. 608-25 AND THIS DRAWING.)

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 608
DWG. NO.
608-30

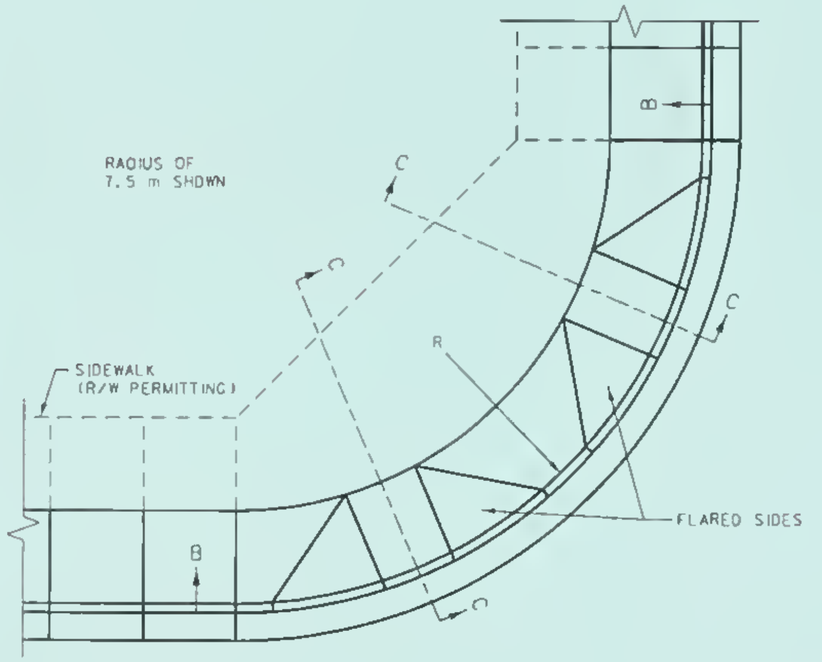
PARALLEL
PUBLIC SIDEWALK
CURB RAMPS

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

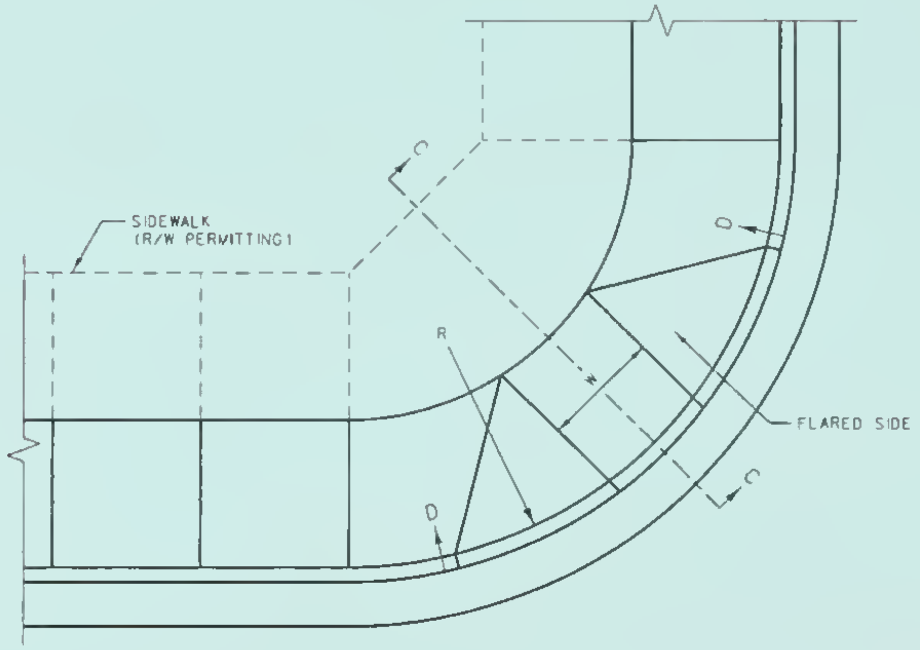
DIAGONAL PUBLIC SIDEWALK CURB RAMP

(FOR RADII 4575 OR GREATER)

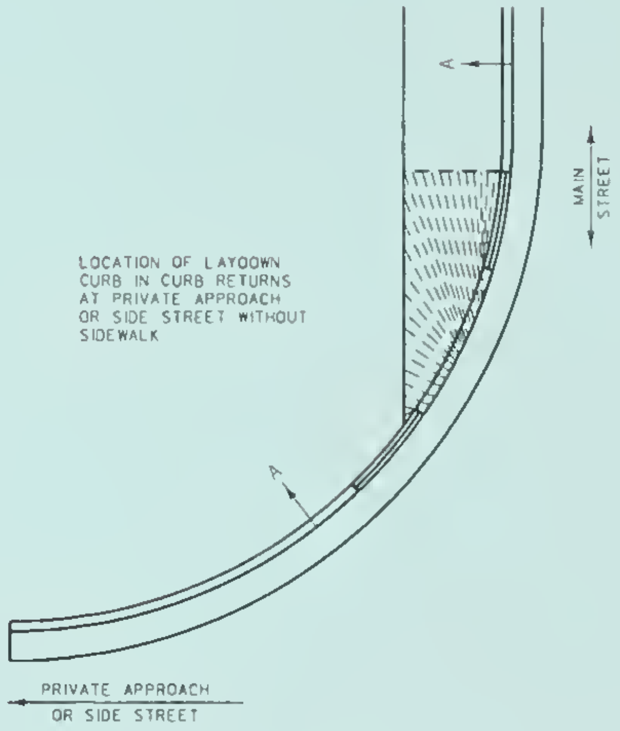


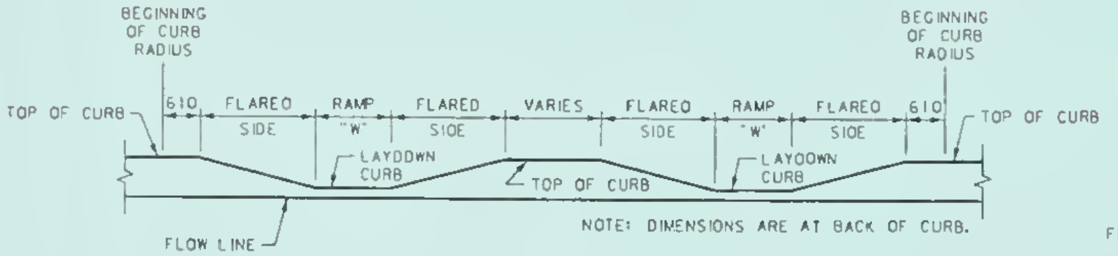
SINGLE DIAGONAL PUBLIC SIDEWALK CURB RAMP

(FOR RADII LESS THAN 4575)



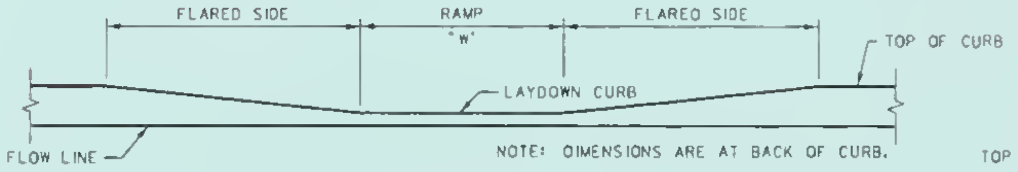
PRIVATE APPROACH SIDEWALK CURB RAMP


A
A
MAIN STREET
LOCATION OF LAYDOWN CURB IN CURB RETURNS AT PRIVATE APPROACH OR SIDE STREET WITHOUT SIDEWALK
PRIVATE APPROACH
OR SIDE STREET



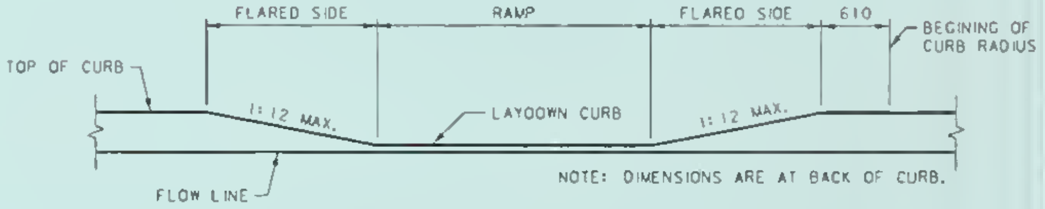
SECTION B-B

(R EQUAL TO OR GREATER THAN 7625)

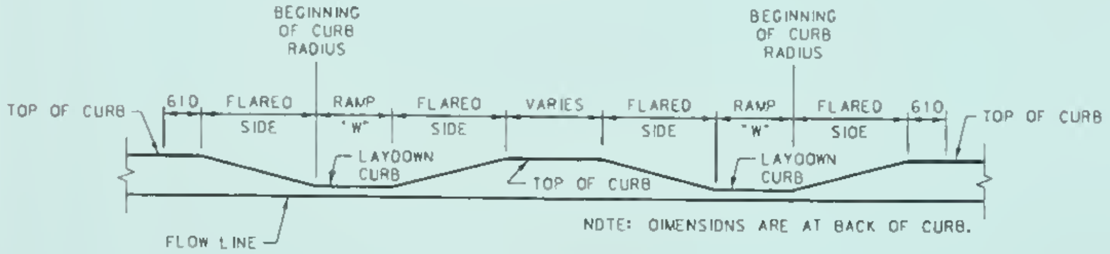


SECTION D-D

(R LESS THAN 4575)

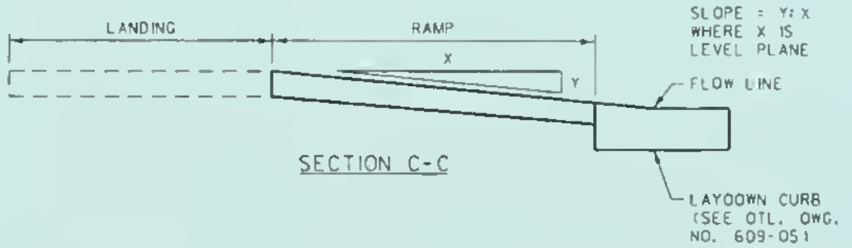


SECTION A-A

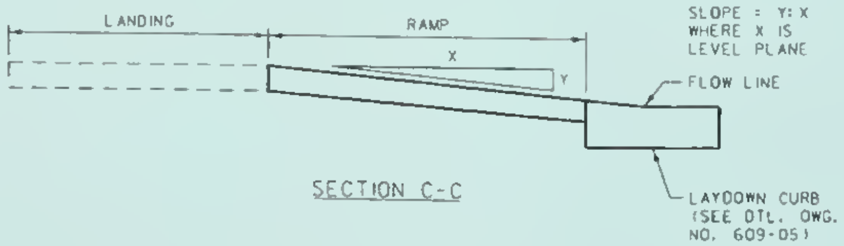


SECTION B-B

(R EQUAL TO OR GREATER THAN 4575, BUT LESS THAN 7625)


LANDING
RAMP
X
Y
SLOPE = Y:X WHERE X IS LEVEL PLANE
FLOW LINE
LAYDOWN CURB (SEE DTL. DWG. NO. 609-05)

SECTION C-C


LANDING
RAMP
X
Y
SLOPE = Y:X WHERE X IS LEVEL PLANE
FLOW LINE
LAYDOWN CURB (SEE DTL. DWG. NO. 609-05)

SECTION C-C

NEW CONSTRUCTION:

NOTE: SINGLE DIAGONAL PUBLIC SIDEWALK CURB RAMPS SERVING TWO STREET CROSSING DIRECTIONS ARE NOT PERMITTED IN NEW CONSTRUCTION.

REQUIREMENTS FOR ALTERATIONS TO EXISTING FACILITIES:

1. THE DESIRABLE WIDTH OF THE CURB RAMP (DIMENSION "W" ABOVE) IS 1220 mm. THE MINIMUM WIDTH IS 915 mm.
2. THE DESIRABLE CURB RAMP SLOPE IS 1:12 OR FLATTER. THE MAXIMUM CURB RAMP SLOPE IS 1:10, PROVIDED THE RISE (DIMENSION "Y" ABOVE) IS 150 mm OR LESS.
3. THE DESIRABLE LANDING LENGTH IS 1220 mm. THE MINIMUM LANDING LENGTH IS 915 mm.
   NOTE: IF EXISTING RIGHT-OF-WAY OR OTHER OBSTRUCTIONS REDUCE THE LANDING LENGTH TO LESS THAN 1220 mm, THE MAXIMUM FLARED SIDE SLOPE IS 1:12.
4. THE MAXIMUM FLARED SIDE SLOPE IS 1:10.
5. THE MAXIMUM CROSS SLOPE OF THE SIDEWALK IS 1:50 (2%).
6. THE SURFACE OF THE PUBLIC SIDEWALK RAMP IS TO CONTRAST VISUALLY WITH THE ADJOINING PUBLIC SIDEWALK SURFACES. THIS CAN BE OBTAINED BY USE OF COLORED CONCRETE, PATTERNING THE CONCRETE SURFACE OR OTHER APPROVED METHODS.
7. WHERE EXISTING SITE DEVELOPMENT CONDITIONS PROHIBIT THE STRICT AND FULL COMPLIANCE OF ALL ADA CRITERIA, PROVIDE ACCESSIBILITY TO THE MAXIMUM EXTENT FEASIBLE.

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING

REFERENCE STANDARD SPEC. SECTION 608	DWG. NO. 608-35

DIAGONAL PUBLIC
SIDEWALK CURB RAMPS

EFFECTIVE: AUGUST 1999

MDT MONTANA DEPARTMENT OF TRANSPORTATION — MONTANA CADD

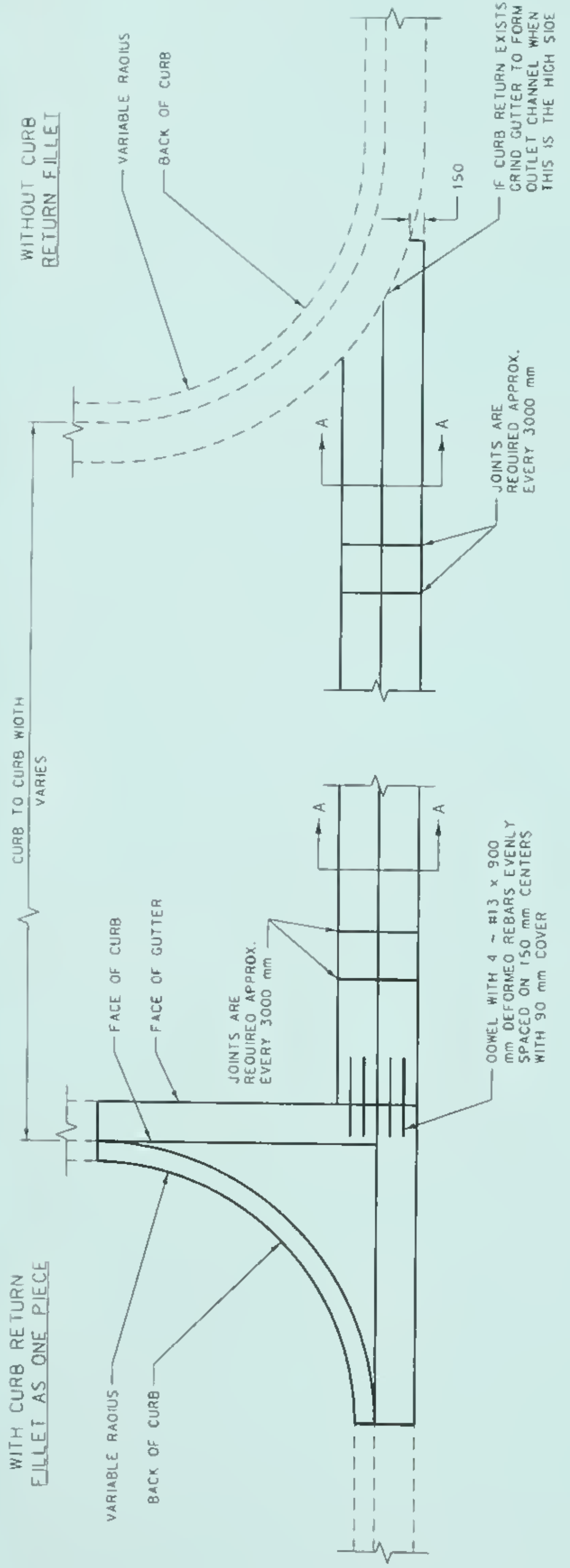
DETAILED DRAWING
REFERENCE DWG. NO
STANDARD SPEC. 609-00
SECTION 609

CONCRETE VALLEY GUTTER

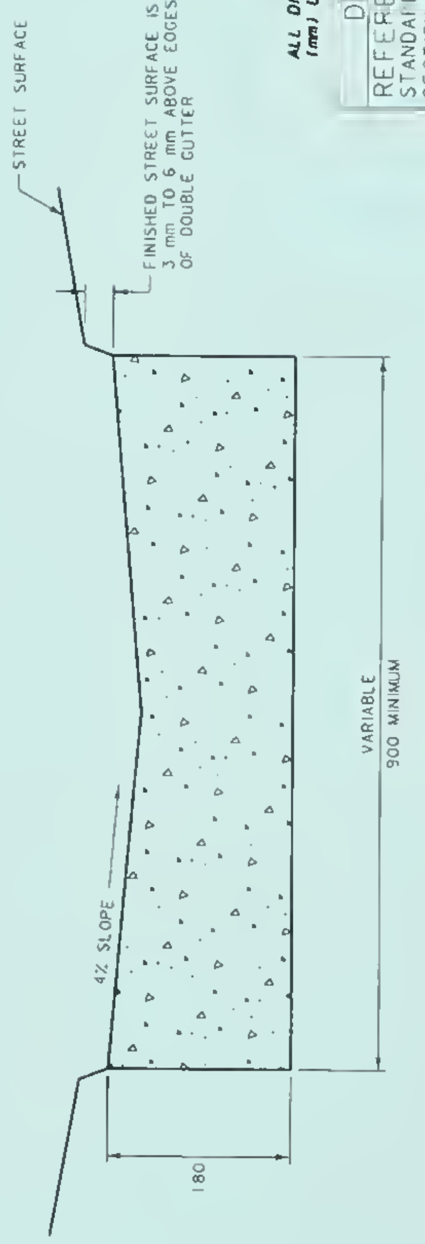
EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.


WITHOUT CURB RETURN FILLET
VARIABLE RADIUS
BACK OF CURB
150
IF CURB RETURN EXISTS, GRIND GUTTER TO FORM OUTLET CHANNEL WHEN THIS IS THE HIGH SIDE
A
A
JOINTS ARE REQUIRED APPROX. EVERY 3000 mm
CURB TO CURB WIDTH VARIES
A
A
FACE OF CURB
FACE OF GUTTER
JOINTS ARE REQUIRED APPROX. EVERY 3000 mm
DOWEL WITH 4 ~ #13 x 900 mm DEFORMED REBARS EVENLY SPACED ON 150 mm CENTERS WITH 90 mm COVER
WITH CURB RETURN FILLET AS ONE PIECE
VARIABLE RADIUS
BACK OF CURB

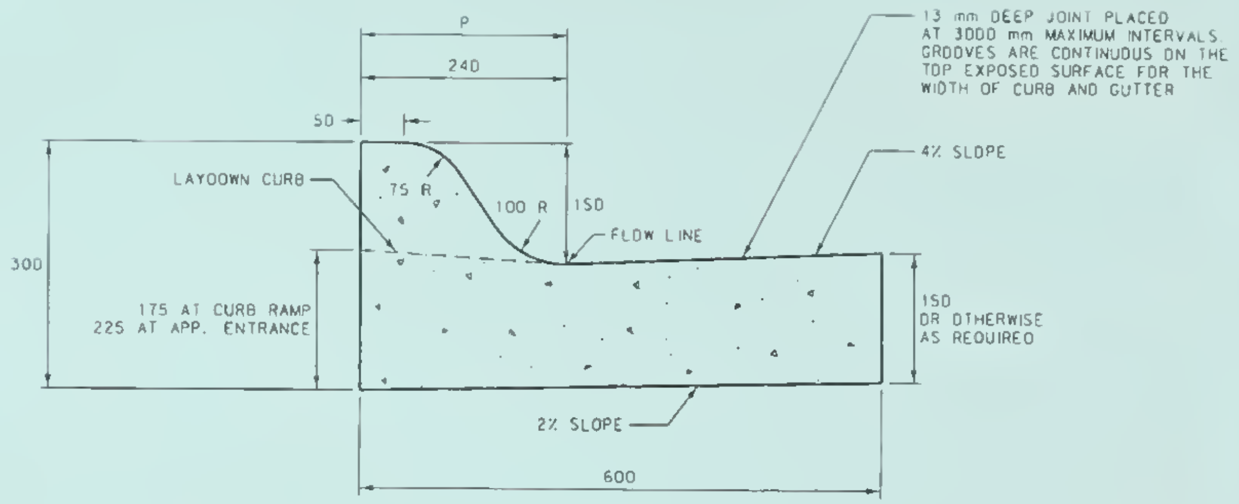
PLAN


STREET SURFACE
FINISHED STREET SURFACE IS 3 mm TO 6 mm ABOVE EDGES OF DOUBLE GUTTER
4% SLOPE
VARIABLE 900 MINIMUM
180

SECTION A-A

NOTE:
THE WIDTH WITH PROPORTIONAL INVERT VARIES TO SATISFY THE DESIGN REQUIREMENTS OF INDIVIDUAL APPLICATIONS.

CONCRETE CURBS


P
240
50
LAYDOWN CURB
75 R
100 R
150
FLOW LINE
13 mm DEEP JOINT PLACED AT 3000 mm MAXIMUM INTERVALS GROOVES ARE CONTINUOUS ON THE TOP EXPOSED SURFACE FOR THE WIDTH OF CURB AND GUTTER
4% SLOPE
300
175 AT CURB RAMP
225 AT APP. ENTRANCE
150 OR OTHERWISE AS REQUIRED
2% SLOPE
600

P = AREA TO BE PAINTED, WHEN PAINTED CURB IS REQUIRED

CURB & GUTTER SECTION
0.110 m³ CONC. PER METER OF CURB FOR 150 mm GUTTER. *

JOINTS:

(A) WHEN INTEGRAL WITH, TIED TO, OR PLACED AGAINST PORTLAND CEMENT CONCRETE PAVEMENT (P.C.C.P.): MATCH TRANSVERSE CONTRACTION AND/OR EXPANSION JOINTS IN THE ADJACENT P.C.C.P. SLAB. IF REQUIRED, EXTEND 13 mm MIN. WIDTH PREFORMED EXPANSION JOINTS COMPLETELY THROUGH CURB AND GUTTER THE SAME WIDTH AS THE P.C.C.P. SLAB JOINT. FILL CURB AND GUTTER EXPANSION JOINTS WITH PREFORMED EXPANSION JOINT FILLER.

(B) ALL OTHER CASES:
SPACE CONTRACTION JOINTS IN CURB AND GUTTER AT 3000 mm INTERVALS EXCEPT AS SPECIFIED IN (A) ABOVE.

(C) CONTRACTION JOINTS:
CONTRACTION JOINTS ARE 3 mm MIN. AND 10 mm MAX. IN WIDTH. FORM JOINTS BY SAWING OR SCORING TO A MINIMUM DEPTH OF 25 mm. FORM SCORED JOINTS BY A TOOL WHICH WILL LEAVE ROUNDED CORNERS AND DESTROY AGGREGATE INTERLOCK TO A MINIMUM DEPTH OF 25 mm.

(D) OTHER JOINTS:
SEPARATE THE CURB AND GUTTER FROM ADJACENT SIDEWALK AT POINTS SHOWN ON DTL. DWG. NO. 608-05 BY 13 mm MIN. WIDTH OF PREFORMED EXPANSION JOINT MATERIAL. PLACE PREFORMED EXPANSION JOINT MATERIAL AT ALL CURB RETURNS, BRIDGES, DROP INLETS, AND WHERE MEETING CURB AND GUTTER IN PLACE.

(E) USE PREFORMED EXPANSION JOINT FILLER MEETING THE REQUIREMENTS OF STD. SPEC. 707.

RADII:

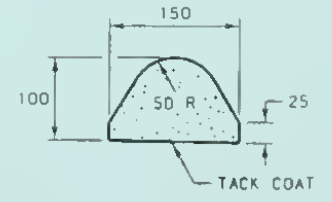
MINIMUM CURB RETURN RADII = 3050 mm. 4575 mm RADII ARE DESIRABLE FOR STREETS.

CONCRETE:

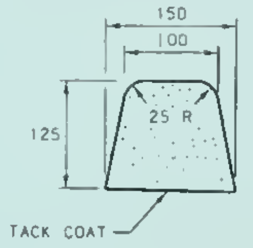
UNLESS OTHERWISE SPECIFIED, CONSTRUCT CONCRETE CURBS AND CONCRETE INTEGRAL CURB AND GUTTER WITH CLASS "D" CONCRETE OR APPROVED EQUAL.

* QUANTITIES FOR ESTIMATING PURPOSES ONLY.

BITUMINOUS CURBS



CURB SECTION
1 m³ OF MATERIAL WILL MAKE ABOUT 89 METERS OF CURB. *



CURB SECTION
1 m³ OF MATERIAL WILL MAKE ABOUT 64 METERS OF CURB. *

NOTES:

WHEN CURB IS USED IN CONJUNCTION WITH GUARDRAIL, USE THE 100 mm TYPE. OTHERWISE, THE CONTRACTOR MAY USE EITHER SECTION.

CONFORM ALL MATERIALS AND CONSTRUCTION TO THE STANDARD SPECIFICATIONS FOR BITUMINOUS CURB.

GRAVEL BASE IS INCLUDED IN THE SURFACING SECTION.

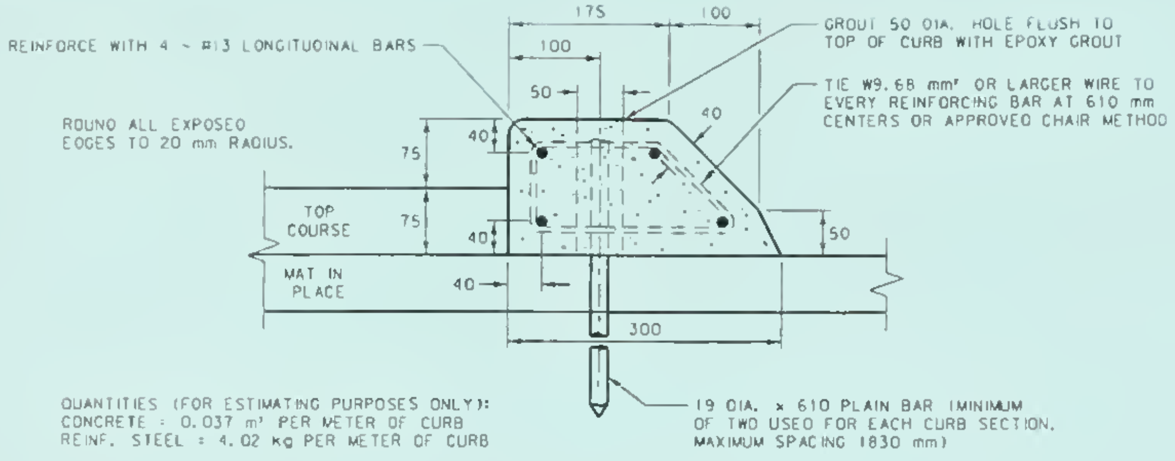
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE DWG. NO.
STANDARD SPEC. 609-05
SECTION 609

MISCELLANEOUS CURBS

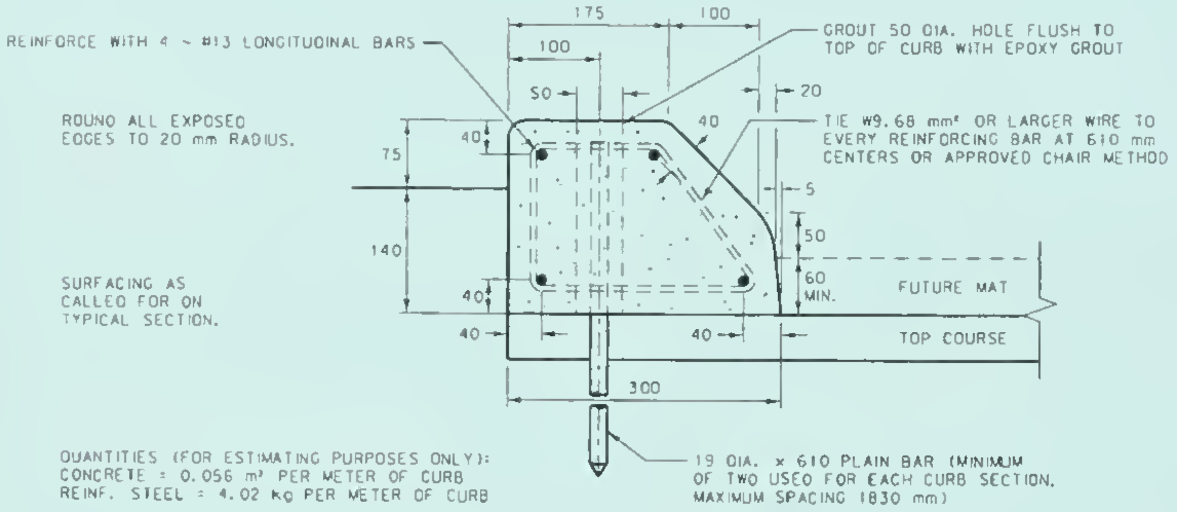
EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD


175
100
100
50
40
40
75
75
40
40
50
300
TOP COURSE
MAT IN PLACE
REINFORCE WITH 4 ~ #13 LONGITUDINAL BARS
ROUND ALL EXPOSED EDGES TO 20 mm RADIUS.
GROUT 50 DIA. HOLE FLUSH TO TOP OF CURB WITH EPOXY GROUT
TIE W9.68 mm² OR LARGER WIRE TO EVERY REINFORCING BAR AT 610 mm CENTERS OR APPROVED CHAIR METHOD
19 DIA. × 610 PLAIN BAR (MINIMUM OF TWO USED FOR EACH CURB SECTION, MAXIMUM SPACING 1830 mm)

QUANTITIES (FOR ESTIMATING PURPOSES ONLY):
CONCRETE = 0.037 m³ PER METER OF CURB
REINF. STEEL = 4.02 kg PER METER OF CURB

TYPE "A" - MAT IN PLACE


175
100
100
50
20
40
40
75
140
40
40
40
5
50
60 MIN.
300
FUTURE MAT
TOP COURSE
REINFORCE WITH 4 ~ #13 LONGITUDINAL BARS
ROUND ALL EXPOSED EDGES TO 20 mm RADIUS.
SURFACING AS CALLED FOR ON TYPICAL SECTION.
GROUT 50 DIA. HOLE FLUSH TO TOP OF CURB WITH EPOXY GROUT
TIE W9.68 mm² OR LARGER WIRE TO EVERY REINFORCING BAR AT 610 mm CENTERS OR APPROVED CHAIR METHOD
19 DIA. × 610 PLAIN BAR (MINIMUM OF TWO USED FOR EACH CURB SECTION, MAXIMUM SPACING 1830 mm)

QUANTITIES (FOR ESTIMATING PURPOSES ONLY):
CONCRETE = 0.056 m³ PER METER OF CURB
REINF. STEEL = 4.02 kg PER METER OF CURB

TYPE "B" - FUTURE MAT

CONSTRUCTION:

CURBS MAY BE CONSTRUCTED USING ANY OF THE FOLLOWING THREE METHODS:
(1) PRECAST
(2) CAST IN PLACE
(3) CONSTRUCTED BY THE USE OF AN APPROVED CURB FORMING OR SLIP FORM MACHINE.

WHEN USING EITHER METHOD (2) OR (3), REINFORCING STEEL IS NOT REQUIRED, WITH THE EXCEPTION OF THE PINS, AND THE CURBS ARE SCORED OR SAWN TO A DEPTH OF 13 mm TO FORM CONTRACTION JOINTS AT INTERVALS OF 3000 mm OR LESS.

FORM PRECAST CURBS IN THEIR INVERTED POSITION, IN LENGTHS NOT LESS THAN 1220 mm, OR MORE THAN 3050 mm.

MATERIAL:

CONSTRUCT CURBS OF CLASS "D" CONCRETE, OR AN APPROVED EQUIVALENT MIX.

EPOXY BINDER FOR GROUTING MUST MEET THE REQUIREMENTS OF AASHTO M 235 (ASTM C 881).

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

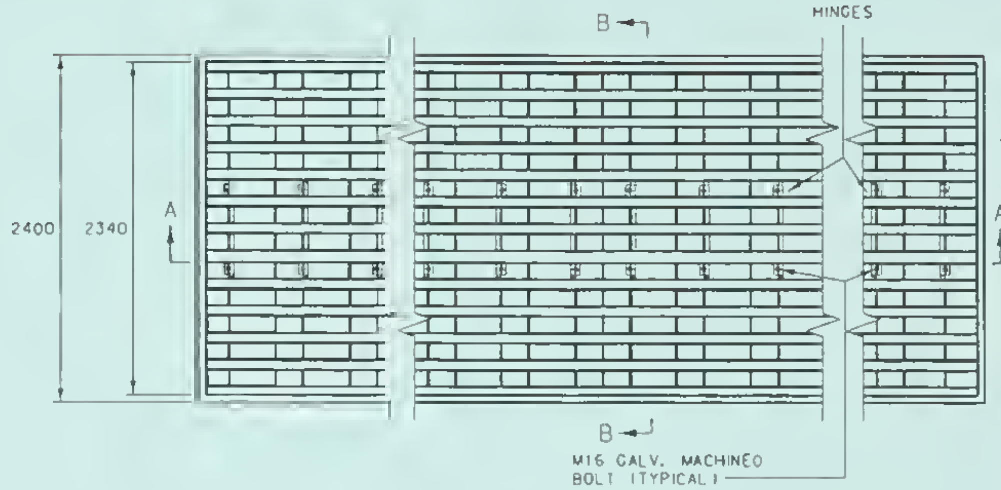
DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 609
DWG. NO.
609-10

MEDIAN CONCRETE CURBS

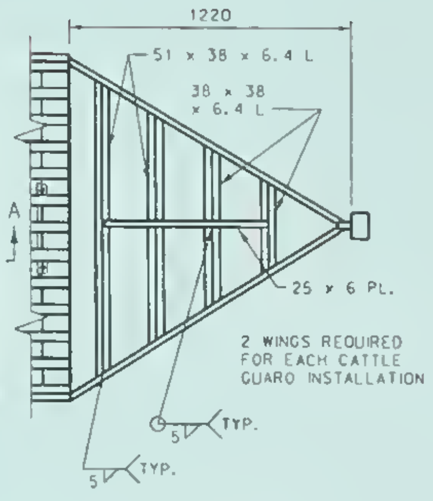
EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

LIVE LOADING: STANDARD (MS18) LOADING

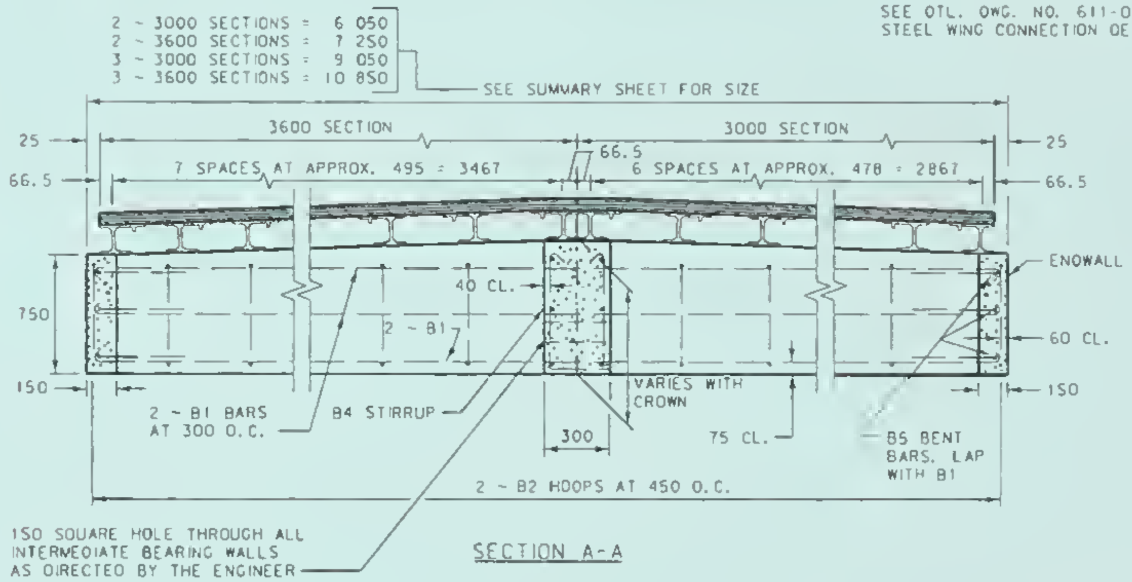


PLAN

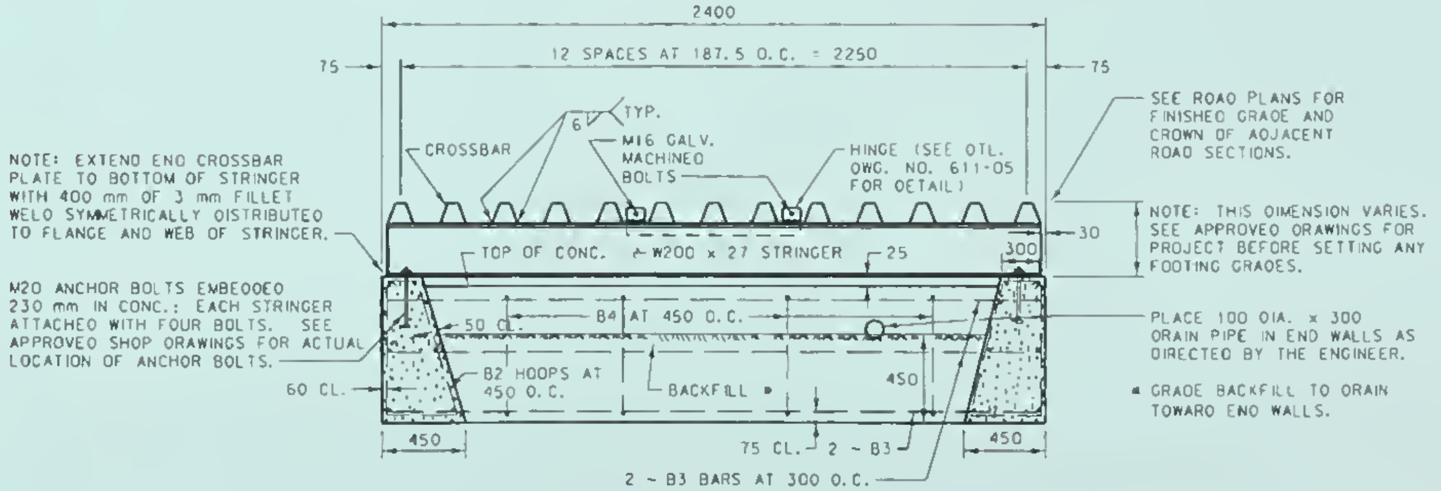


STEEL WING

SEE DTL. DWG. NO. 611-05 FOR STEEL WING CONNECTION DETAIL.


2 ~ 3000 SECTIONS = 6 050
2 ~ 3600 SECTIONS = 7 250
3 ~ 3000 SECTIONS = 9 050
3 ~ 3600 SECTIONS = 10 850
SEE SUMMARY SHEET FOR SIZE
3600 SECTION
3000 SECTION
25
25
66.5
66.5
66.5
7 SPACES AT APPROX. 495 = 3467
6 SPACES AT APPROX. 478 = 2867
ENDWALL
750
150
150
40 CL.
2 ~ B1
60 CL.
VARIES WITH CROWN
2 ~ B1 BARS AT 300 O.C.
B4 STIRRUP
300
75 CL.
B5 BENT BARS, LAP WITH B1
2 ~ B2 HOOPS AT 450 O.C.
150 SQUARE HOLE THROUGH ALL INTERMEDIATE BEARING WALLS AS DIRECTED BY THE ENGINEER

SECTION A-A



NOTE: EXTEND END CROSSBAR PLATE TO BOTTOM OF STRINGER WITH 400 mm OF 3 mm FILLET WELD SYMMETRICALLY DISTRIBUTED TO FLANGE AND WEB OF STRINGER.

M20 ANCHOR BOLTS EMBEDDED 230 mm IN CONC.: EACH STRINGER ATTACHED WITH FOUR BOLTS. SEE APPROVED SHOP DRAWINGS FOR ACTUAL LOCATION OF ANCHOR BOLTS.

SEE ROAD PLANS FOR FINISHED GRADE AND CROWN OF ADJACENT ROAD SECTIONS.

NOTE: THIS DIMENSION VARIES. SEE APPROVED DRAWINGS FOR PROJECT BEFORE SETTING ANY FOOTING GRADES.

PLACE 100 DIA. × 300 DRAIN PIPE IN END WALLS AS DIRECTED BY THE ENGINEER.

* GRADE BACKFILL TO DRAIN TOWARD END WALLS.

MAX. FOOTING PRESS = 105 kPa

SECTION B-B

NOTE:
SEE DTL. DWG. NO. 611-05 FOR CAST-IN-PLACE CATTLE GUARD DETAILS AND BILL OF REINFORCING STEEL.

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 611
DWG. NO.
611-00

CAST-IN-PLACE
CATTLE GUARD

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

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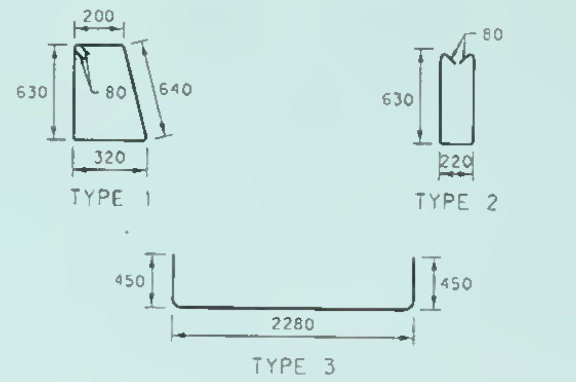
BILL OF REINFORCING STEEL

BENT BARS (ALL DIMENSIONS ARE OUT TO OUT)



6050 CATTLE GUARD
(6.0 m RDWY.)

MARK	SIZE	NO.	TYPE	LENGTH
B1	#13	12	STR.	5930
B2	#13	28	1	1940
B3	#13	6	STR.	2280
B4	#13	4	2	1640
B5	#13	6	3	3180
ESTIMATED WT. = 163.8 kg				

9050 CATTLE GUARD
(9.0 m RDWY.)

MARK	SIZE	NO.	TYPE	LENGTH
B1	#13	12	STR.	8930
B2	#13	42	1	1940
B3	#13	12	STR.	2280
B4	#13	8	2	1640
B5	#13	6	3	3180
ESTIMATED WT. = 246.7 kg				

7250 CATTLE GUARD
(7.2 m RDWY.)

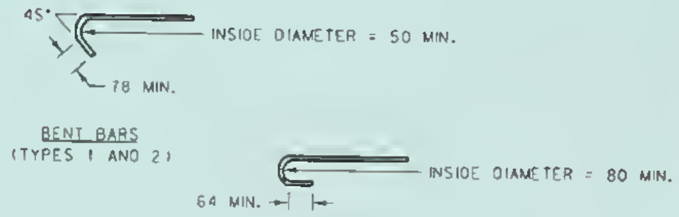
B1	#13	12	STR.	7130
B2	#13	34	1	1940
B3	#13	6	STR.	2280
B4	#13	4	2	1640
B5	#13	6	3	3180
ESTIMATED WT. = 189.7 kg				

10 850 CATTLE GUARD
(10.8 m RDWY.)

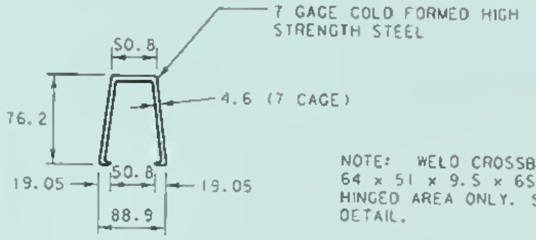
B1	#13	12	STR.	10730
B2	#13	50	1	1940
B3	#13	12	STR.	2280
B4	#13	8	2	1640
B5	#13	6	3	3180
ESTIMATED WT. = 283.6 kg				

ESTIMATED CLASS "A" CONC. QUANTITIES

6 050 CATTLE GUARD = 4.8 m³
7 250 CATTLE GUARD = 5.6 m³
9 050 CATTLE GUARD = 7.4 m³
10 850 CATTLE GUARD = 8.9 m³

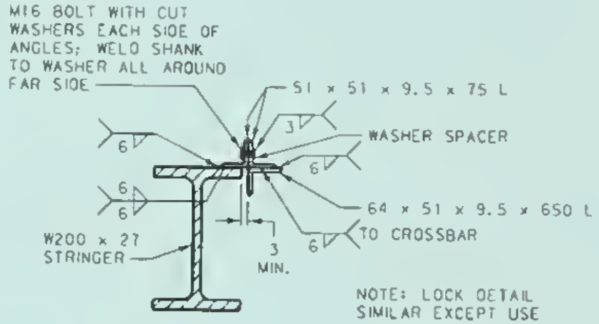


REBAR DETAILS



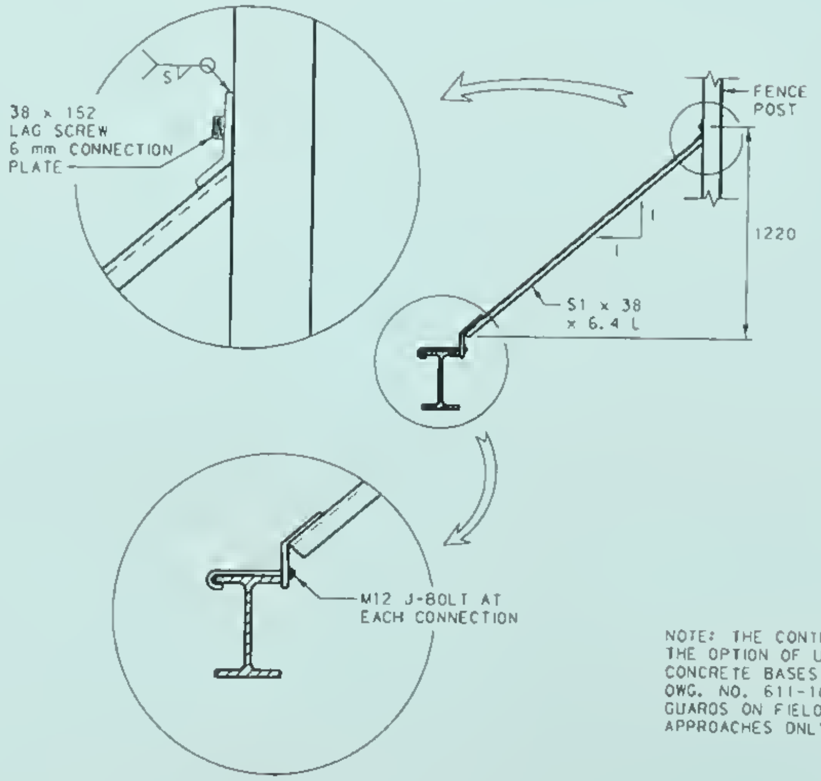
CROSSBAR

NOTE: WELD CROSSBARS TO 64 x 51 x 9.5 x 650 ANGLES HINGED AREA ONLY. SEE HINGE DETAIL.

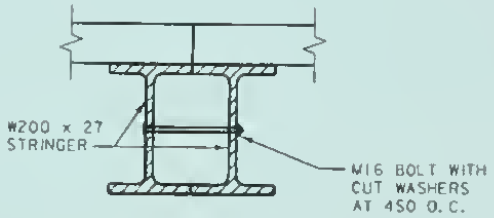


HINGE DETAIL
(HINGED AREA OPENS FOR CLEANOUT)

NOTE: LOCK DETAIL SIMILAR EXCEPT USE M16 GALV. MACHINED BOLT WITH GALV. CUT WASHER & GALV. HEX NUTS INSTEAD OF WELDED STUD BOLT.



STEEL WING CONNECTION DETAILS



MULTIPLE INSTALLATION JOINT

NOTE: THE CONTRACTOR HAS THE OPTION OF USING PRECAST CONCRETE BASES (SEE DTL. DWG. NO. 611-10) FOR CATTLE GUARDS ON FIELD OR PRIVATE APPROACHES ONLY.

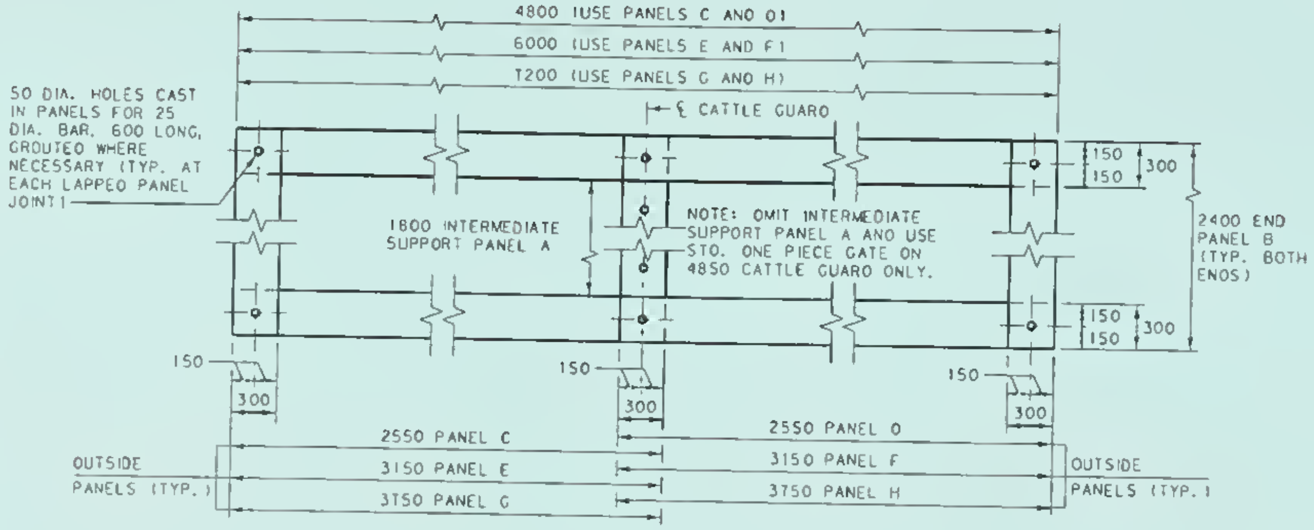
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 611
DWG. NO.
611-05

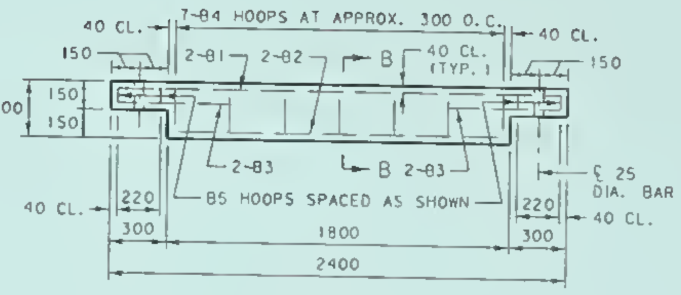
CAST-IN-PLACE
CATTLE GUARD DETAILS

EFFECTIVE: AUGUST 1999

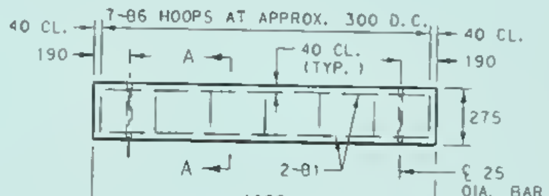
MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD


4800 (USE PANELS C AND D)
6000 (USE PANELS E AND F)
7200 (USE PANELS G AND H)
℄ CATTLE GUARD
50 DIA. HOLES CAST IN PANELS FOR 25 DIA. BAR, 600 LONG, GROUTED WHERE NECESSARY (TYP. AT EACH LAPPED PANEL JOINT)
1800 INTERMEDIATE SUPPORT PANEL A
NOTE: OMIT INTERMEDIATE SUPPORT PANEL A AND USE STD. ONE PIECE GATE ON 4850 CATTLE GUARD ONLY.
2400 END PANEL B (TYP. BOTH ENDS)
150
300
2550 PANEL C
3150 PANEL E
3750 PANEL G
2550 PANEL D
3150 PANEL F
3750 PANEL H
OUTSIDE PANELS (TYP.)
OUTSIDE PANELS (TYP.)

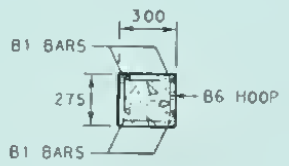
TYPICAL PLAN VIEW



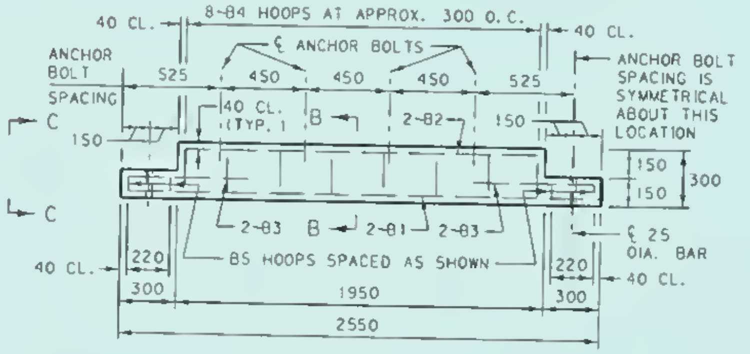
END PANEL B ELEVATION



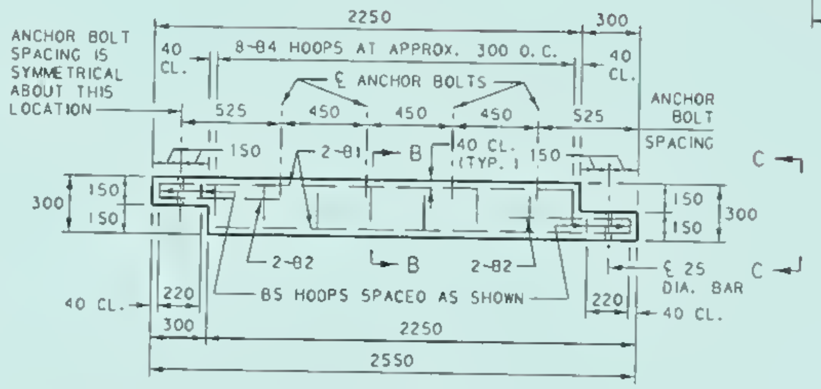
INTERMEDIATE SUPPORT PANEL A ELEVATION



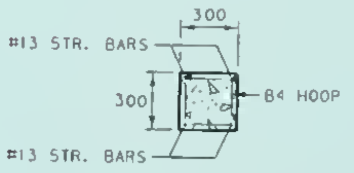
SECTION A-A



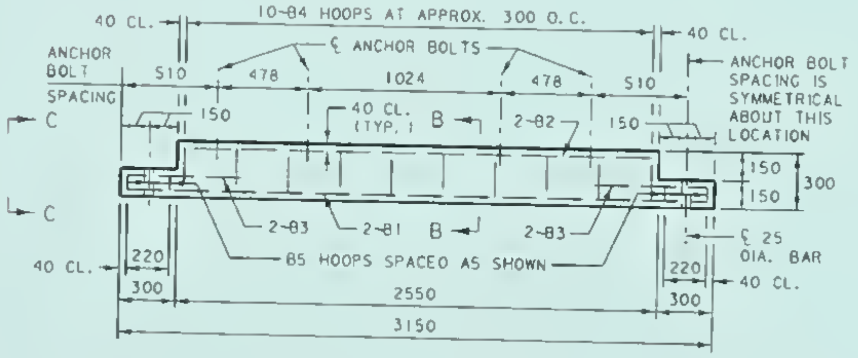
PANEL C ELEVATION



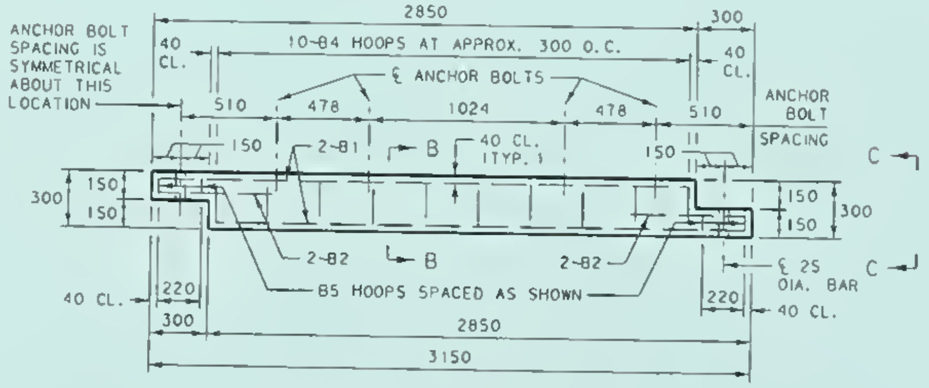
PANEL D ELEVATION



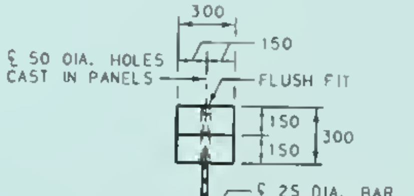
SECTION B-B



PANEL E ELEVATION

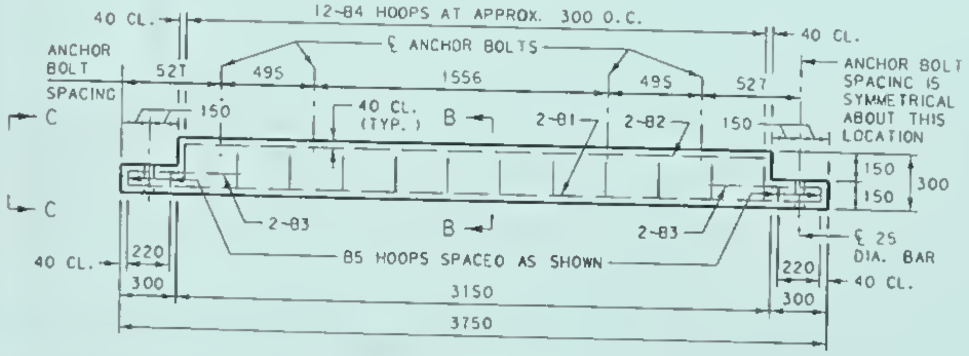


PANEL F ELEVATION

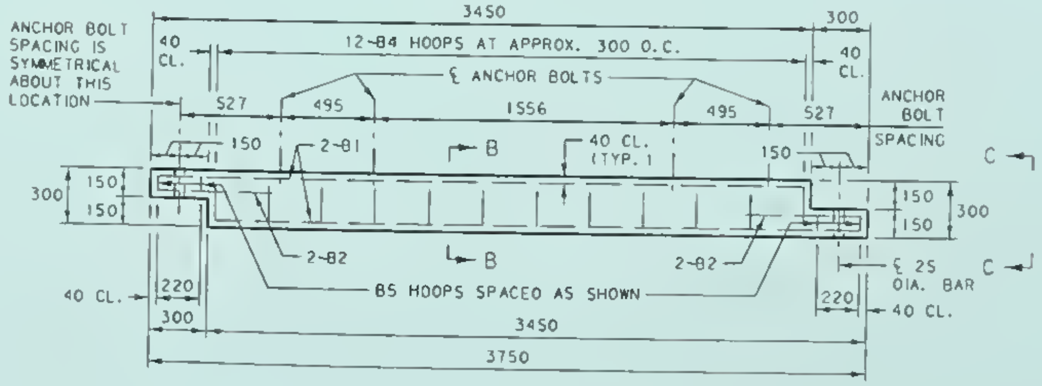

300
150
℄ 50 DIA. HOLES CAST IN PANELS
FLUSH FIT
150
300
℄ 25 DIA. BAR x 600 (GROUTED WHERE NECESSARY)

VIEW C-C

(TYP. LAPPED PANEL JOINT)

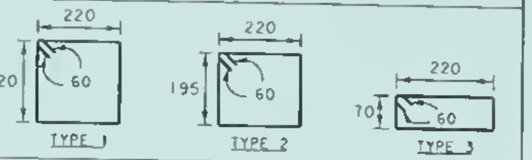


PANEL G ELEVATION



PANEL H ELEVATION

BILL OF REINFORCING STEEL *



STRAIGHT BARS & BENT BARS (ALL DIMENSIONS OUT TO OUT)

MARK	SIZE	NO.	TYPE	LENGTH
1800 SECTION - PANEL A				
B1	#13	4	STRAIGHT	1720
B6	#10	7	2	950
ESTIMATED WT. = 10.6 kg				
2400 SECTION - PANEL B				
B1	#13	2	STRAIGHT	2320
B2	#13	2	STRAIGHT	1720
B3	#13	4	STRAIGHT	650
B4	#10	7	1	1000
B5	#10	4	3	700
ESTIMATED WT. = 16.1 kg				
2550 SECTION - PANEL C				
B1	#13	2	STRAIGHT	2470
B2	#13	2	STRAIGHT	1870
B3	#13	4	STRAIGHT	650
B4	#10	8	1	1000
B5	#10	4	3	700
ESTIMATED WT. = 17.3 kg				
2550 SECTION - PANEL D				
B1	#13	4	STRAIGHT	2170
B2	#13	4	STRAIGHT	650
B4	#10	8	1	1000
B5	#10	4	3	700
ESTIMATED WT. = 17.3 kg				
3150 SECTION - PANEL E				
B1	#13	2	STRAIGHT	3070
B2	#13	2	STRAIGHT	2470
B3	#13	4	STRAIGHT	650
B4	#10	10	1	1000
B5	#10	4	3	700
ESTIMATED WT. = 20.8 kg				
3150 SECTION - PANEL F				
B1	#13	4	STRAIGHT	2770
B2	#13	4	STRAIGHT	650
B4	#10	10	1	1000
B5	#10	4	3	700
ESTIMATED WT. = 20.8 kg				
3750 SECTION - PANEL G				
B1	#13	2	STRAIGHT	3670
B2	#13	2	STRAIGHT	3070
B3	#13	4	STRAIGHT	650
B4	#10	12	1	1000
B5	#10	4	3	700
ESTIMATED WT. = 24.3 kg				
3750 SECTION - PANEL H				
B1	#13	4	STRAIGHT	3370
B2	#13	4	STRAIGHT	650
B4	#10	12	1	1000
B5	#10	4	3	700
ESTIMATED WT. = 24.3 kg				

* FOR ONE PANEL ONLY

ESTIMATED CLASS "D" CONCRETE QUANTITIES
1800 SECTION - PANEL A = 0.15 m³
2400 SECTION - PANEL B = 0.19 m³
2550 SECTION - PANEL C = 0.20 m³
2550 SECTION - PANEL D = 0.20 m³
3150 SECTION - PANEL E = 0.26 m³
3150 SECTION - PANEL F = 0.26 m³
3750 SECTION - PANEL G = 0.31 m³
3750 SECTION - PANEL H = 0.31 m³

NOTE:
FOR DETAILS OF STEEL GRATES AND STEEL WINGS SEE DTL. DWG. NO. 611-00 AND 611-05.

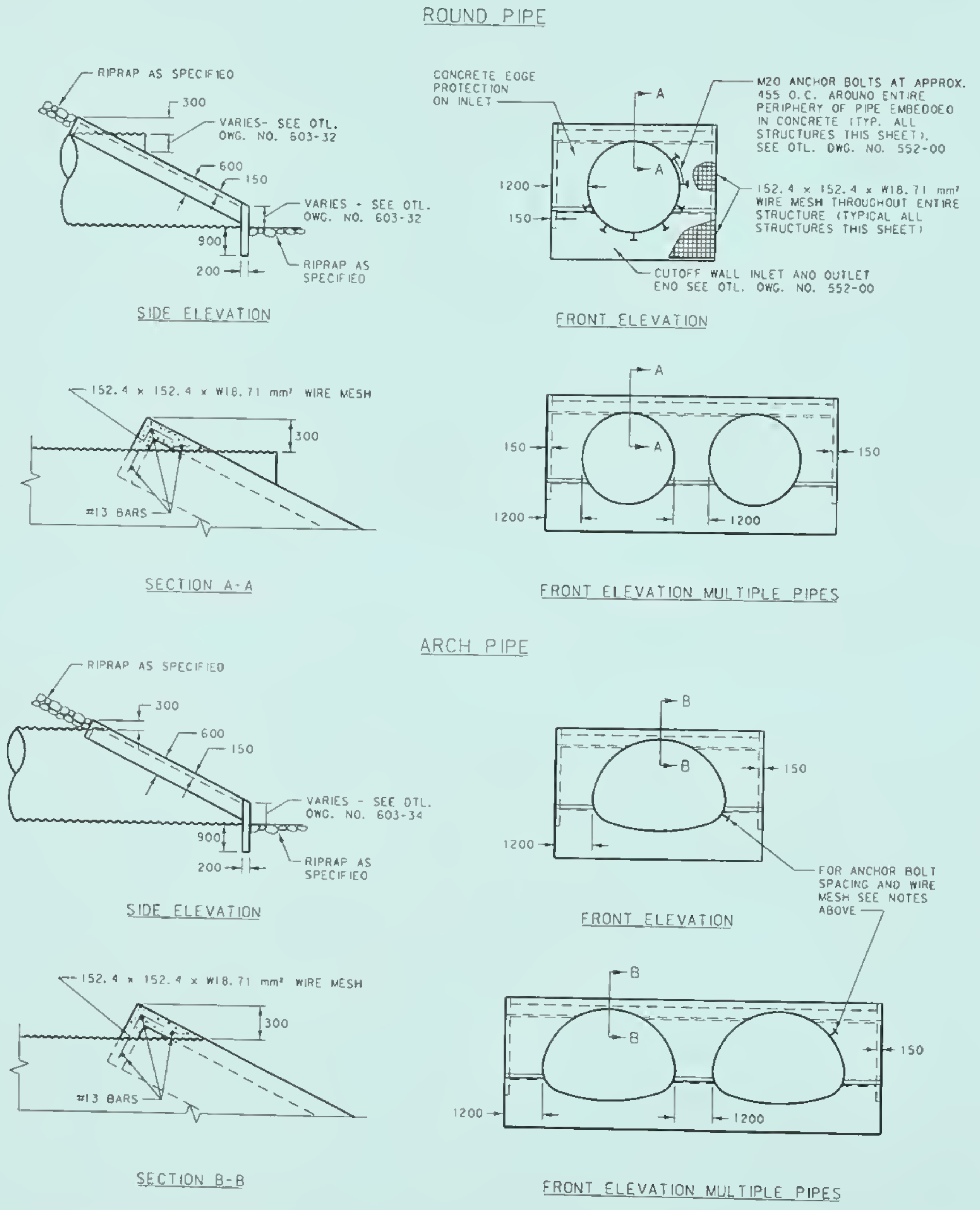
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 611
DWG. NO.
611-10

PRECAST CONCRETE
BASE FOR
CATTLE GUARD

EFFECTIVE: AUGUST 1999

MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD


ROUND PIPE
RIPRAP AS SPECIFIED
300
VARIES- SEE DTL. DWG. NO. 603-32
600
150
VARIES - SEE DTL. DWG. NO. 603-32
900
200
RIPRAP AS SPECIFIED
SIDE ELEVATION
CONCRETE EDGE PROTECTION ON INLET
M20 ANCHOR BOLTS AT APPROX. 455 O.C. AROUND ENTIRE PERIPHERY OF PIPE EMBEDDED IN CONCRETE (TYP. ALL STRUCTURES THIS SHEET). SEE DTL. DWG. NO. 552-00
152.4 × 152.4 × W18.71 mm² WIRE MESH THROUGHOUT ENTIRE STRUCTURE (TYPICAL ALL STRUCTURES THIS SHEET)
A
1200
150
CUTOFF WALL INLET AND OUTLET END SEE DTL. DWG. NO. 552-00
FRONT ELEVATION
152.4 × 152.4 × W18.71 mm² WIRE MESH
300
#13 BARS
SECTION A-A
150
1200
FRONT ELEVATION MULTIPLE PIPES
ARCH PIPE
RIPRAP AS SPECIFIED
300
600
150
VARIES - SEE DTL. DWG. NO. 603-34
900
200
RIPRAP AS SPECIFIED
SIDE ELEVATION
B
150
1200
FRONT ELEVATION
FOR ANCHOR BOLT SPACING AND WIRE MESH SEE NOTES ABOVE
152.4 × 152.4 × W18.71 mm² WIRE MESH
300
#13 BARS
SECTION B-B
FRONT ELEVATION MULTIPLE PIPES

NOTE:
ALL CONCRETE IS CLASS 'DD' OR EQUAL.

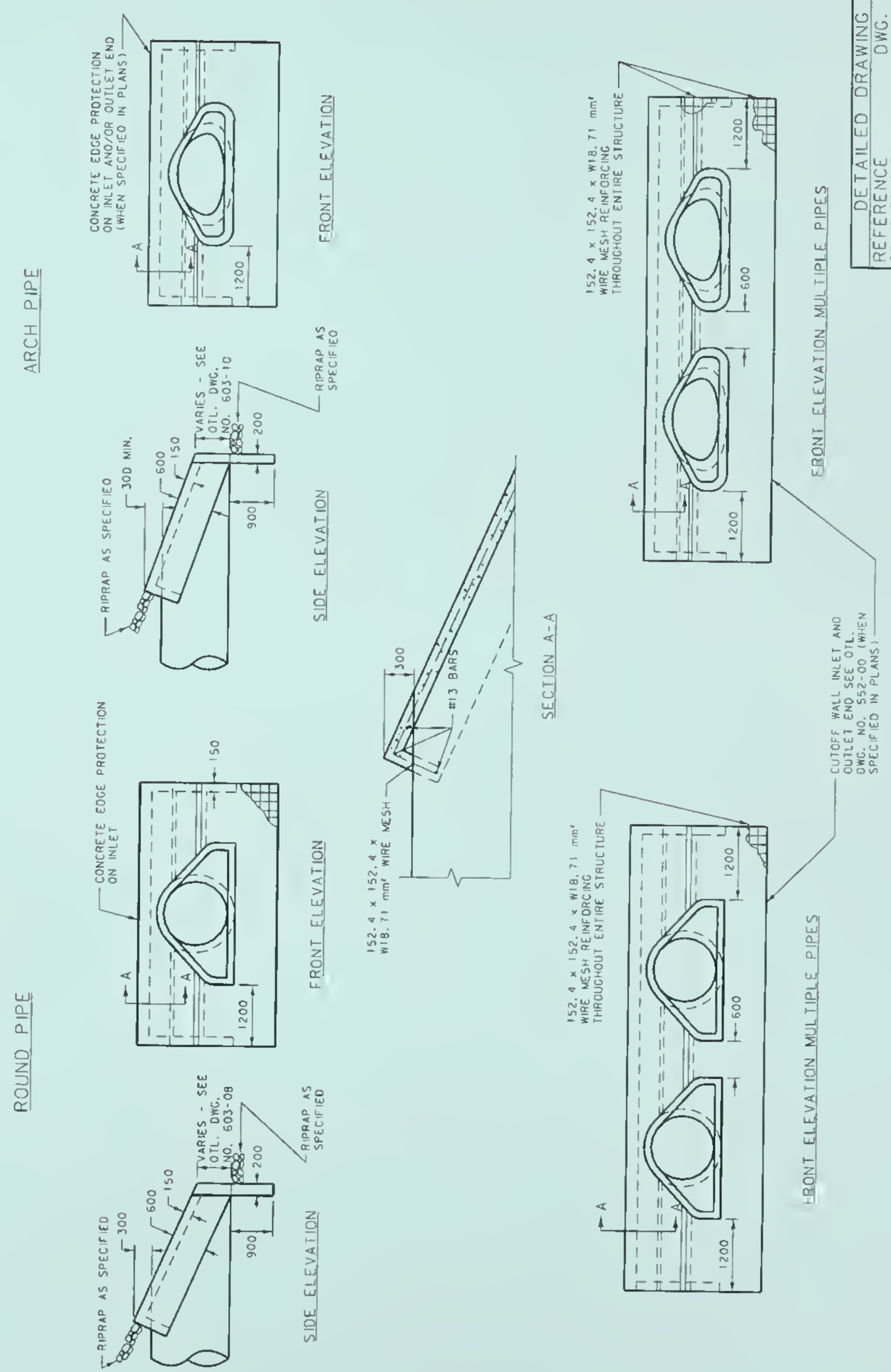
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 613
DWG. NO.
613-06

CONCRETE EDGE PROTECTION
FOR METAL CULVERTS

EFFECTIVE: AUGUST 1999

MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD


ARCH PIPE
CONCRETE EDGE PROTECTION ON INLET AND/OR OUTLET END (WHEN SPECIFIED IN PLANS)
A
1200
FRONT ELEVATION
RIPRAP AS SPECIFIED
300 MIN.
600
150
VARIES - SEE DTL. DWG. NO. 603-10
200
900
RIPRAP AS SPECIFIED
SIDE ELEVATION
152.4 × 152.4 × W18.71 mm² WIRE MESH REINFORCING THROUGHOUT ENTIRE STRUCTURE
1200
600
FRONT ELEVATION MULTIPLE PIPES
300
#13 BARS
152.4 × 152.4 × W18.71 mm² WIRE MESH
SECTION A-A
CUTOFF WALL INLET AND OUTLET END SEE DTL. DWG. NO. 552-00 (WHEN SPECIFIED IN PLANS)
ROUND PIPE
CONCRETE EDGE PROTECTION ON INLET
150
FRONT ELEVATION
RIPRAP AS SPECIFIED
300
600
150
VARIES - SEE DTL. DWG. NO. 603-08
200
900
RIPRAP AS SPECIFIED
SIDE ELEVATION
152.4 × 152.4 × W18.71 mm² WIRE MESH REINFORCING THROUGHOUT ENTIRE STRUCTURE
FRONT ELEVATION MULTIPLE PIPES

NOTES:
ALL CONCRETE IS CLASS 'DD' OR EQUAL.

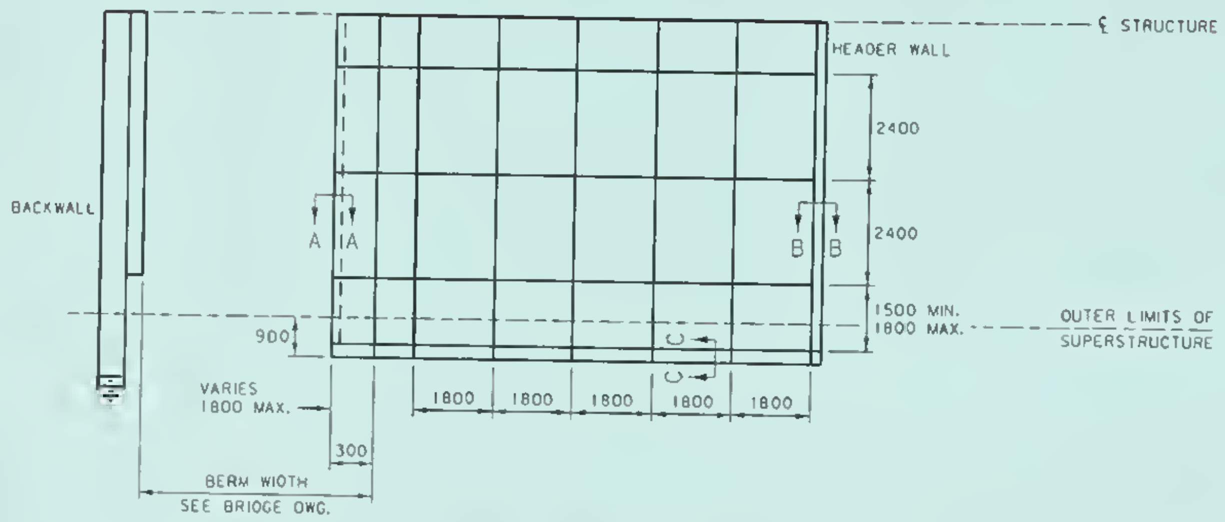
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 603,613
DWG. NO.
613-08

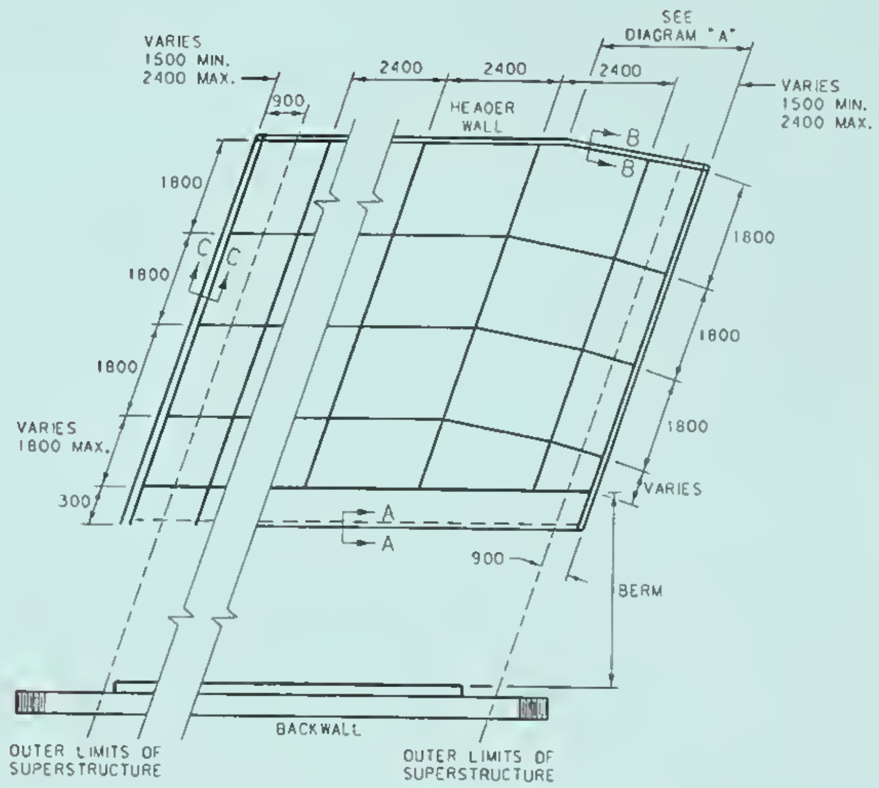
CONCRETE EDGE PROTECTION
FOR CONCRETE CULVERTS

EFFECTIVE: AUGUST 1999

MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



STRAIGHT STRUCTURE



SKEWED STRUCTURE

CAST-IN-PLACE CONCRETE:

LOCATE JOINTS AS INDICATED ON THE PLANS. IF CONSTRUCTION IS STOPPED FOR OVER TWO HOURS, CREATE A CONSTRUCTION JOINT. USE CLASS "D" CONCRETE FOR ALL CAST-IN-PLACE CONCRETE.

USE AN APPROVED 13 mm EXPANSION JOINT FILLER WHENEVER THE CAST-IN-PLACE CONCRETE ABUTS AGAINST ANY PART OF THE BRIDGE STRUCTURE.

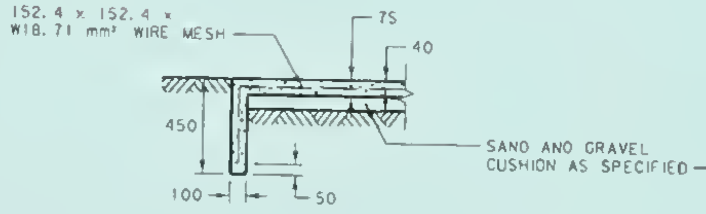
CLEAR THE EMBANKMENT SLOPE OF ALL BRUSH, DEBRIS AND RUBBLE. A CUSHION IS NOT REQUIRED FOR GRAVEL EMBANKMENT SLOPES. FINISH ALL SLOPES TO A REASONABLY UNIFORM SURFACE OR TO THE SLOPE INDICATED IN THE BRIDGE PLANS. COMPACT ALL LOOSE MATERIAL TO THE SATISFACTION OF THE ENGINEER. LEAVE THE ADJACENT SLOPE AREA IN A SMOOTH, UNIFORM CONDITION.

REINFORCING STEEL:

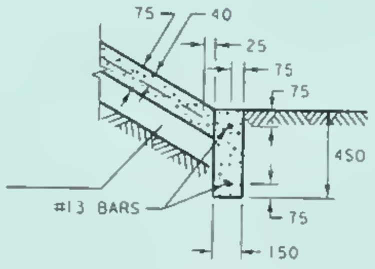
(MAY USE EITHER ALTERNATE LISTED BELOW)

1. #10 BARS AT 250 O.C. (HORIZONTAL AND VERTICAL SPACING) MIN. COVER OF 50 mm
2. 152.4 × 152.4 × W18.71 mm² WIRE MESH

300 mm OVERLAP REQUIRED AT CONSTRUCTION JOINTS FOR REINFORCING STEEL AND WIRE MESH.

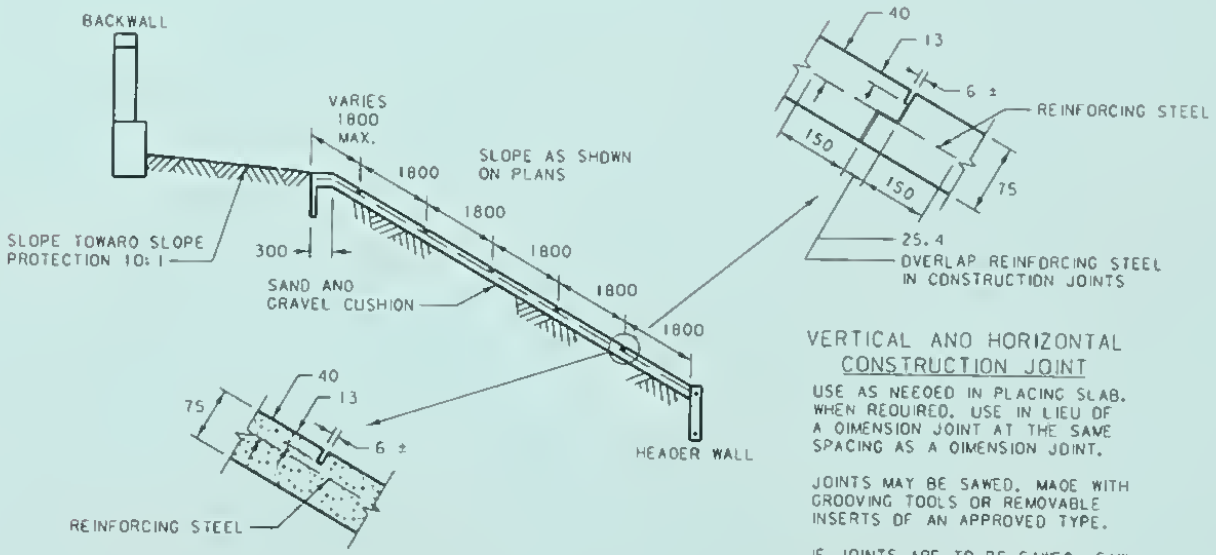

152.4 × 152.4 × W18.71 mm² WIRE MESH
75
40
450
100
50
SAND AND GRAVEL CUSHION AS SPECIFIED

SECTION A-A



SECTION B-B

HEADER WALL



VERTICAL AND HORIZONTAL
CONSTRUCTION JOINT

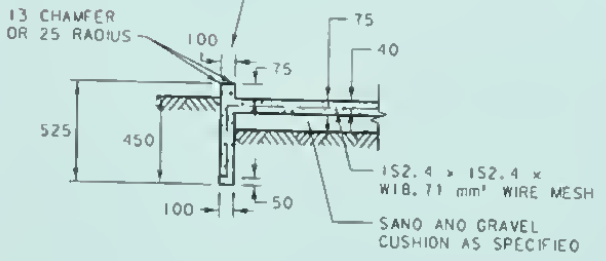
USE AS NEEDED IN PLACING SLAB. WHEN REQUIRED, USE IN LIEU OF A DIMENSION JOINT AT THE SAME SPACING AS A DIMENSION JOINT.

JOINTS MAY BE SAWED, MADE WITH GROOVING TOOLS OR REMOVABLE INSERTS OF AN APPROVED TYPE.

IF JOINTS ARE TO BE SAWED, SAW JOINTS JUST AFTER CONCRETE HAS SET BUT BEFORE UNCONTROLLED CRACKING OCCURS.

VERTICAL AND HORIZONTAL
DIMENSION JOINT

1800 mm VERTICAL SPACING OR AS NOTED. 2400 mm HORIZONTAL SPACING OR AS NOTED. JOINTS MAY BE SAWED, MADE WITH GROOVING TOOLS OR REMOVABLE INSERTS OF AN APPROVED TYPE.


13 CHAMFER OR 25 RADIUS
100
75
75
40
525
450
100
50
152.4 × 152.4 × W18.71 mm² WIRE MESH
SAND AND GRAVEL CUSHION AS SPECIFIED

PLACE 75 mm CURB SECTION MONOLITHICALLY WITH THE SLOPE PROTECTION CONCRETE. RUN DIMENSION JOINTS 75 mm THROUGH CURB.

SECTION C-C

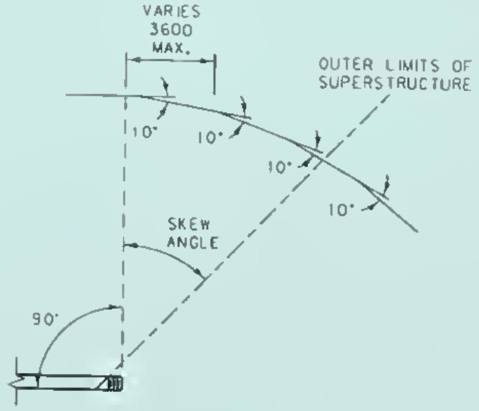


DIAGRAM "A"

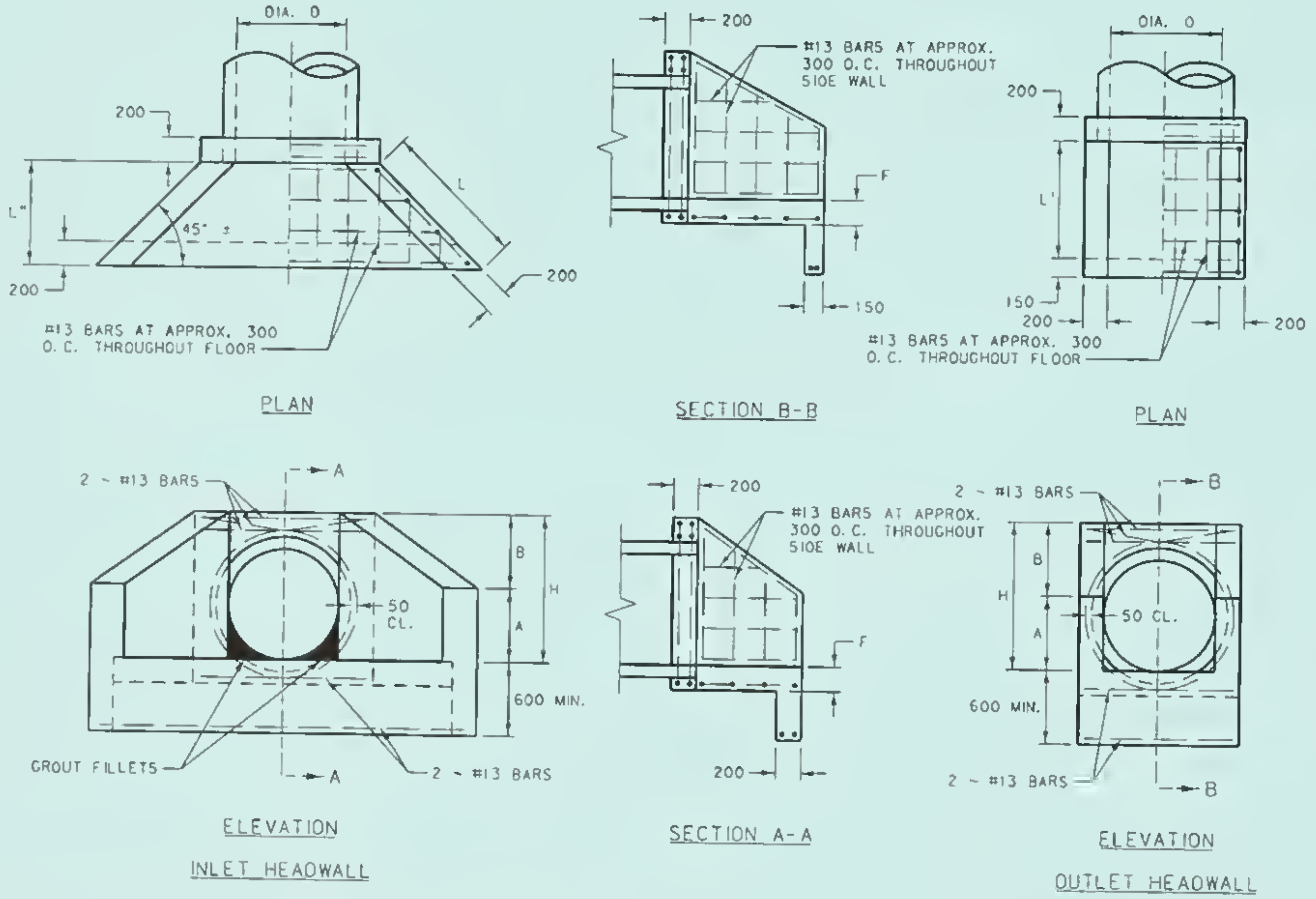
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 613
DWG. NO.
613-10

CONCRETE SLOPE
PROTECTION

EFFECTIVE: AUGUST 1999

MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



CHAMFER ALL EXPOSED CORNERS 25 mm. REINFORCING STEEL TO BE NOT LESS THAN 40 mm TO NEAREST FACE OF CONCRETE.

INLET AND OUTLET HEADWALLS FOR RCP

CULVERT		CL. "DD" CONC. OR EQUAL (m³)		DIMENSION TABLE						
DIA. D	AREA (m²)	INLET	OUTLET	A	B	H	L	L'	F	L'
450	0.164	0.7	0.5	400	400	800	750	550	200	650
600	0.292	0.8	0.6	450	450	900	900	650	200	750
750	0.456	1.1	0.8	550	550	1100	1050	750	200	850
900	0.657	1.4	1.0	600	600	1200	1200	850	250	950
1050	0.894	1.7	1.2	700	700	1400	1350	950	250	1050
1200	1.167	2.0	1.4	750	750	1500	1500	1050	250	1150

INLET AND OUTLET HEADWALLS FOR CMP

CULVERT		CL. "DD" CONC. OR EQUAL (m³)		DIMENSION TABLE						
DIA. D	AREA (m²)	INLET	OUTLET	A	B	H	L	L'	F	L'
450	0.159	0.6	0.5	400	400	800	750	550	150	650
600	0.283	0.8	0.6	450	450	900	900	650	150	750
750	0.442	1.1	0.8	550	550	1100	1050	750	150	850
900	0.636	1.3	0.9	600	600	1200	1200	850	150	950
1050	0.866	1.6	1.1	700	700	1400	1350	950	150	1050
1200	1.131	1.8	1.3	750	750	1500	1500	1050	150	1150

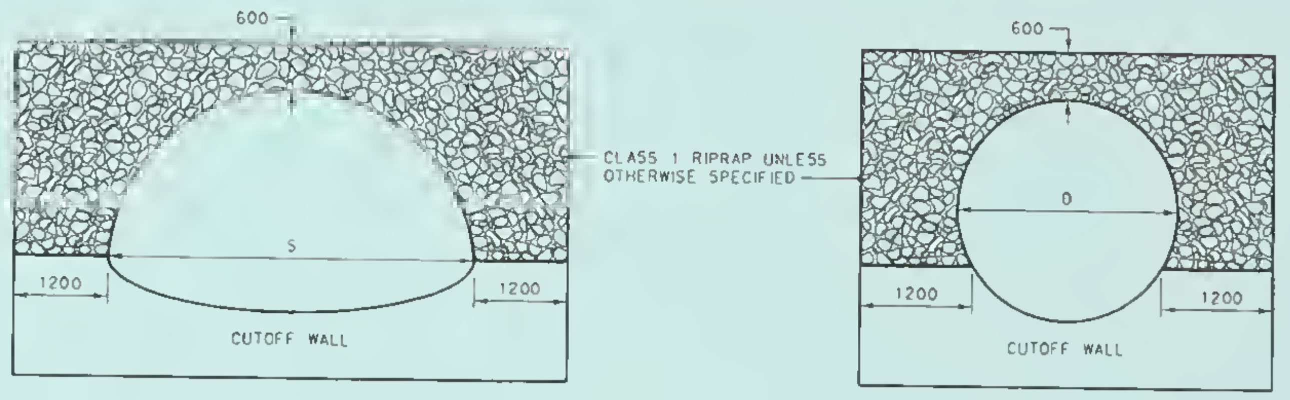
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

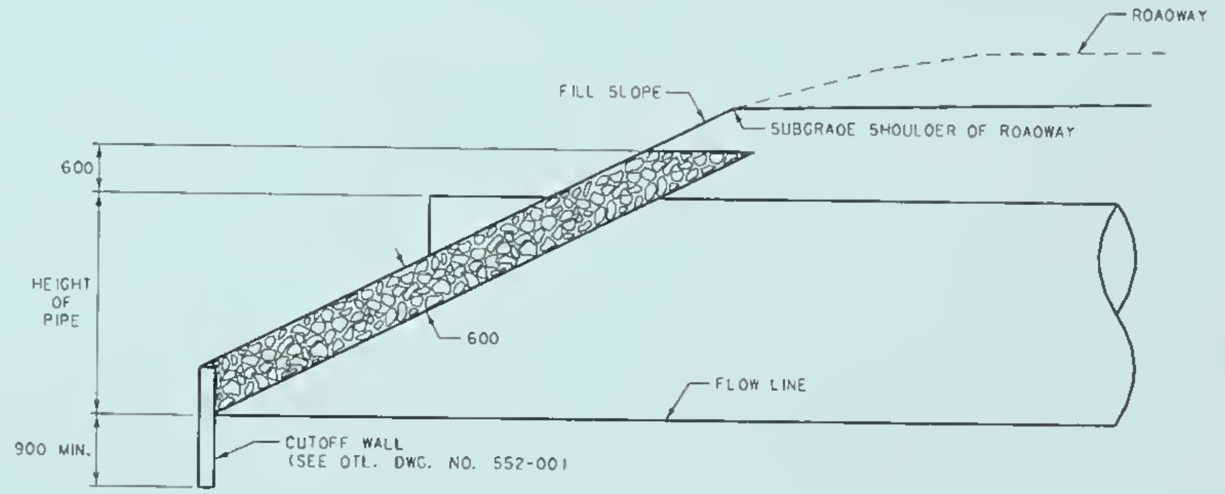
DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 613
DWG. NO.
613-12

INLET AND OUTLET
HEADWALLS FOR
RCP AND CMP PIPES

EFFECTIVE: AUGUST 1999

MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD




ROADWAY
FILL SLOPE
SUBGRADE SHOULDER OF ROADWAY
600
HEIGHT OF PIPE
600
FLOW LINE
900 MIN.
CUTOFF WALL (SEE DTL. DWG. NO. 552-00)

NOTES:

KEY ENDS OF RIPRAP WALLS INTO THE EMBANKMENT SLOPES A MINIMUM OF 600 mm FROM OUTER FACE OF THE RIPRAP FOR THE FULL HEIGHT OF THE RIPRAP WALL.

SEE SPECIFICATIONS FOR GRADATION, CLASS AND CONSTRUCTION METHODS.

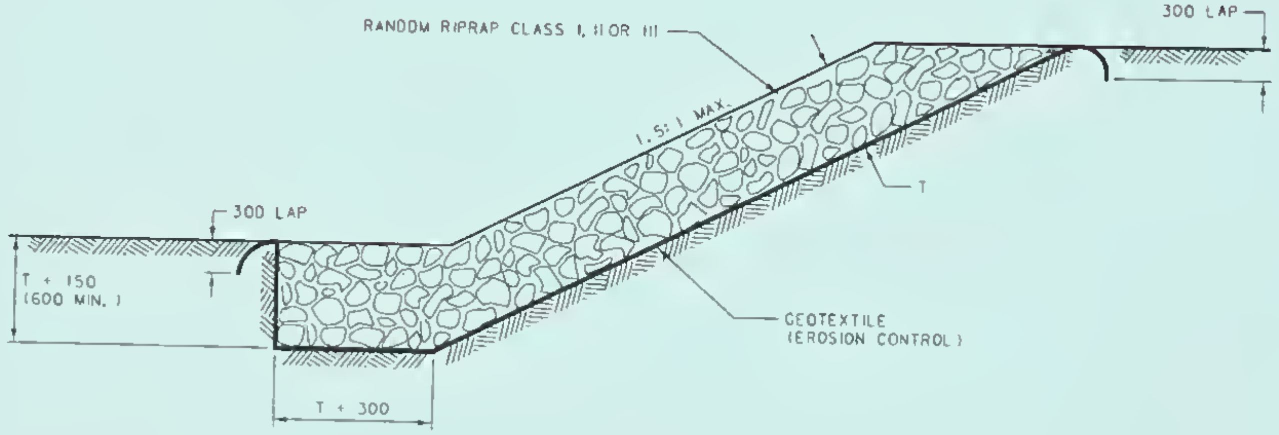
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 613
DWG. NO.
613-14

CULVERT RIPRAP

EFFECTIVE: AUGUST 1999

MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



EMBANKMENT PROTECTION

MINIMUM T FOR:
CLASS I RIPRAP = 450
CLASS II RIPRAP = 750
CLASS III RIPRAP = 900

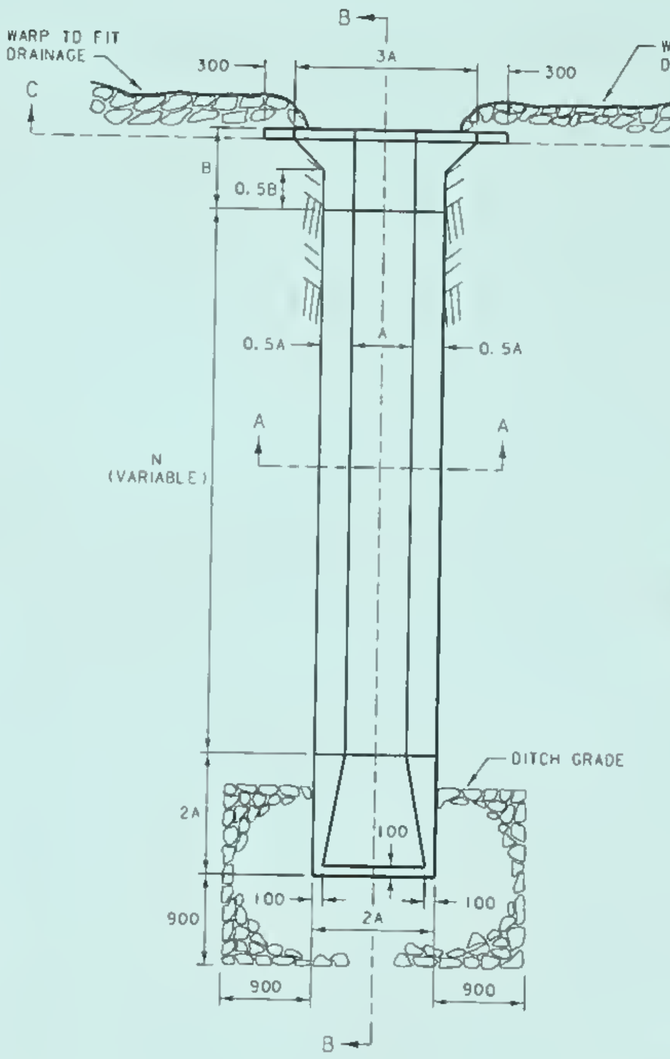
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 613.622
DWG. NO.
613-16

EMBANKMENT PROTECTION

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



CONCRETE:

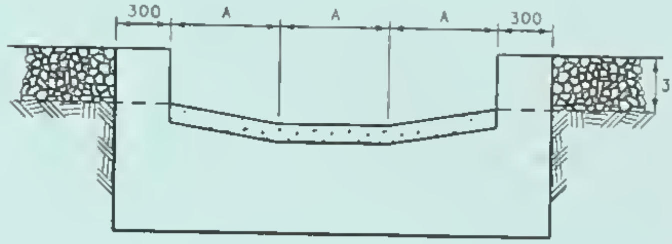
USE CLASS "AC" OR "OC" CONCRETE UNLESS OTHERWISE NOTED, CONFORMING TO SECTION 551 OF THE STANDARD SPECIFICATIONS. CONCRETE MAY BE PNEUMATICALLY APPLIED.

- BANK PROTECTION:

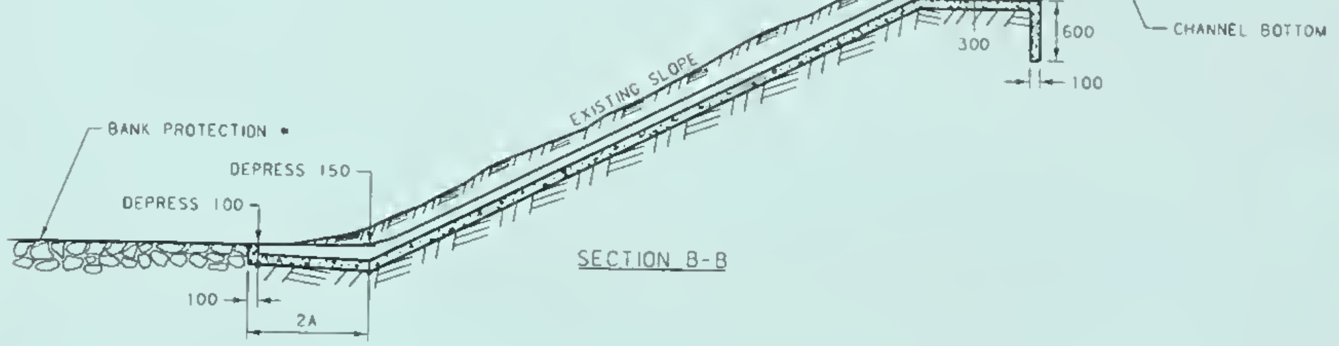
USE TYPE III BANK PROTECTION, CONFORMING TO SUBSECTION 613.03.2 OF THE STANDARD SPECIFICATIONS. THICKNESS IS 300 mm MIN.

INLET CONDITIONS:

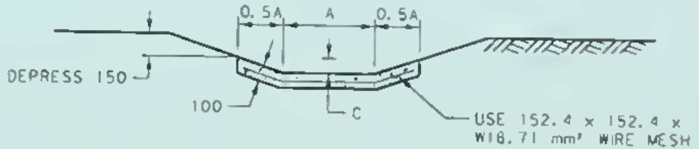
DEPRESS THE INLET BELOW THE NATURAL DRAINAGE BASIN TO PREVENT FLOW FROM SIDE CHANNELING OVER THE SLOPE BEFORE REACHING THE CHUTE.



SECTION C-C



SECTION B-B


0.5A
A
0.5A
DEPRESS 150
100
C
USE 152.4 × 152.4 × W18.71 mm² WIRE MESH THROUGHOUT CONCRETE DRAINAGE CHUTE.

SECTION A-A

TYPE	DIMENSIONS			QUANTITIES
	A	B	C	CONCRETE
1	600	1200	100	0.49 m³ + N × 0.123 m³/m
2	600	1200	300	0.53 m³ + N × 0.143 m³/m
3	1200	2450	300	1.60 m³ + N × 0.254 m³/m
4	1200	2450	450	1.66 m³ + N × 0.269 m³/m

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 551, 613
DWG. NO.
613-18

CONCRETE DRAINAGE CHUTE

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

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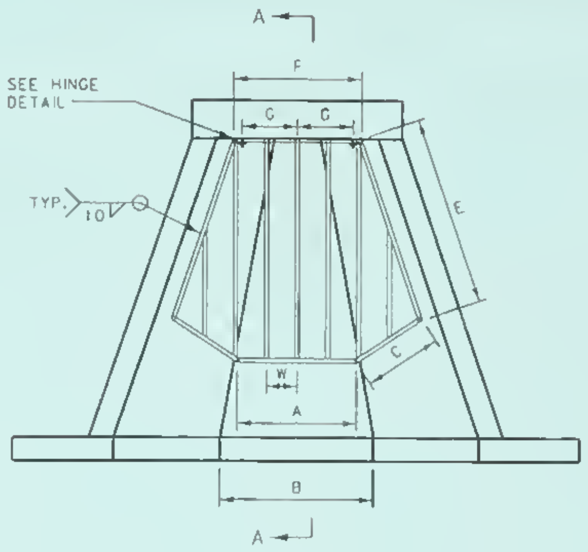
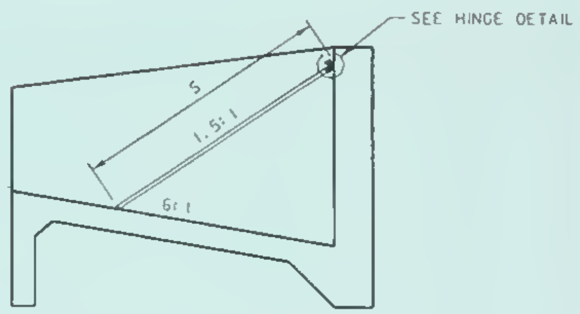


PLAN VIEW



SECTION A-A

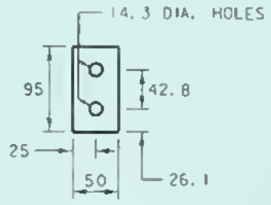
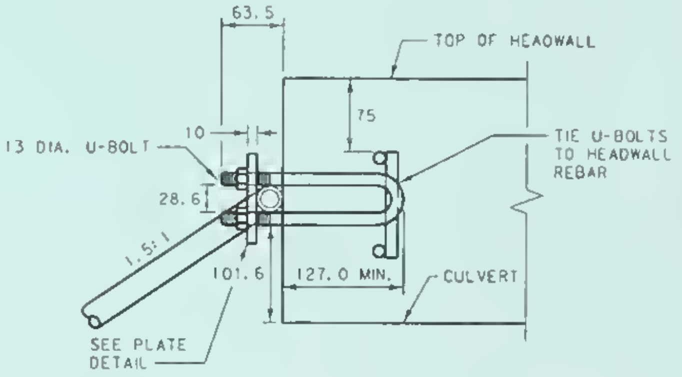


PLATE DETAIL



HINGE DETAIL

CSP									
CULVERT DIA. D	DIMENSIONS								19 DIA. GSP OR #16 REBAR *
	B	A	C	E	F	S	W	G	
450	450	363	226	707	244	841	110	70	5956
450	750	601	210	738	244	841	140	82	6160
450	1050	838	195	783	244	841	131	82	7498
600	600	472	326	857	396	1061	152	113	7699
600	900	695	308	887	396	1061	180	140	7983
600	1200	921	293	924	396	1061	155	116	9696
750	750	582	427	1009	549	1280	143	235	11 579
750	1050	677	408	1036	549	1280	165	235	11 378
750	1350	1015	390	1070	549	1280	183	235	11 805
900	900	692	527	1161	701	1500	174	305	13 777
900	1200	1207	509	1186	701	1500	192	305	14 441
900	1500	1113	491	1216	701	1500	171	302	16 203
1050	1050	802	628	1314	853	1719	204	366	15 895
1050	1350	1009	607	1338	853	1719	180	305	18 450
1050	1650	1216	588	1466	853	1719	192	335	18 870
1200	1200	911	725	1466	1006	1942	189	457	20 812
1200	1500	1116	707	1491	1006	1942	201	457	21 068
1200	1800	1320	689	1515	1006	1942	180	457	24 198

RCP									
CULVERT DIA. D	DIMENSIONS								19 DIA. GSP OR #16 REBAR *
	B	A	C	E	F	S	W	G	
450	450	387	244	786	244	933	119	79	6517
450	750	652	226	823	244	933	152	82	6715
450	1050	914	210	875	244	933	140	82	8245
600	600	494	348	954	396	1170	162	122	8382
600	900	750	329	988	396	1170	143	104	10 305
600	1200	997	311	1030	396	1170	168	128	10 561
750	750	619	451	1122	549	1408	152	235	12 479
750	1050	857	430	1155	549	1408	174	235	12 588
750	1350	1094	415	1192	549	1408	159	235	14 768
900	900	735	555	1292	701	1649	183	305	14 883
900	1200	963	533	1323	701	1649	165	290	17 380
900	1500	1195	515	1353	701	1649	183	305	17 468
1050	1050	850	658	1460	853	1887	174	305	19 766
1050	1350	1076	637	1487	853	1887	189	335	20 025
1050	1650	1302	619	1521	853	1887	204	366	20 297
1200	1200	966	759	1631	1006	2125	198	457	22 476
1200	1500	1189	741	1658	1006	2125	177	457	26 018
1200	1800	1411	719	1686	1006	2125	192	457	25 960

DIMENSIONS AND QUANTITIES ARE FOR ESTIMATING PURPOSES ONLY.

NOTES:

PAINT ALL WELDS AND OTHER NON-GALVANIZED PARTS IN ACCORDANCE WITH SECTION 710 OF THE STANDARD SPECIFICATIONS.

USE OF PIPE OR REBAR FOR TRASHGUARD TO BE DETERMINED BY THE ENGINEER.

W = CENTER TO CENTER PIPE OR REBAR SPACING.

TWO 13 DIA. U-BOLT AND PLATE ASSEMBLIES NEEDED PER TRASHGUARD.

* 19 mm DIA. SCHEDULE 80 GALV. STEEL PIPE (GSP)

OR

#16 REINFORCING BAR (REBAR = 1.552 kg/m)

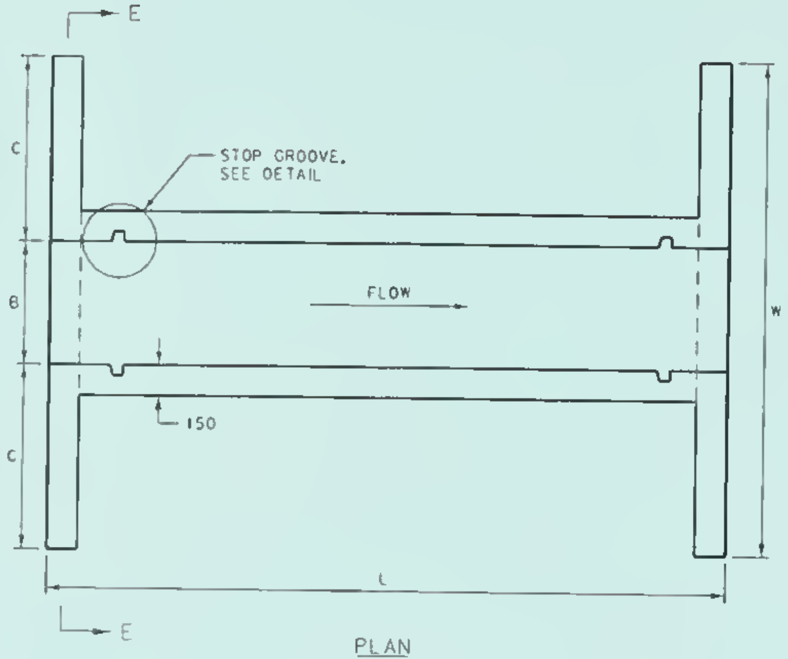
ALL DIMENSIONS ARE MILLIMETERS ([illegible]) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 615
DWG. NO.
615-02

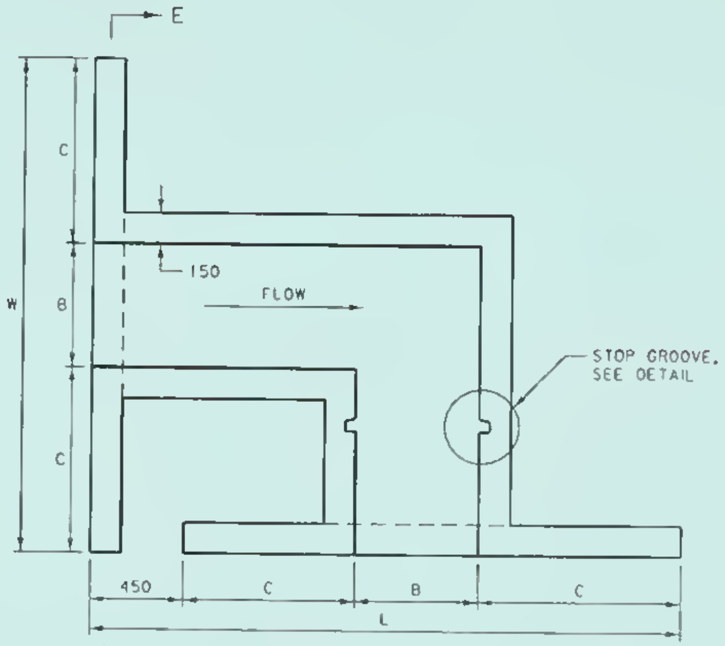
TRASHGUARD FOR CONCRETE
IRRIGATION INLET AND OUTLET
TRANSITION STRUCTURES

EFFECTIVE: AUGUST 1999

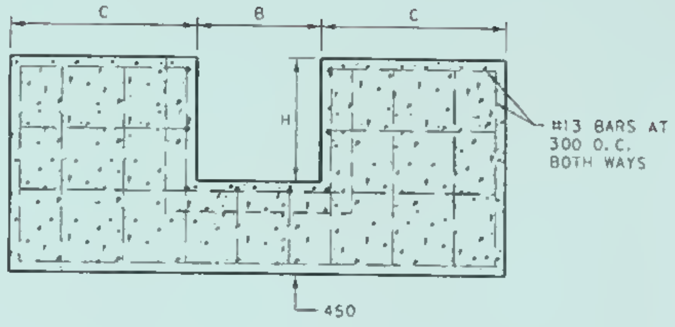
MDT *MONTANA DEPARTMENT OF TRANSPORTATION*
MONTANA CADD



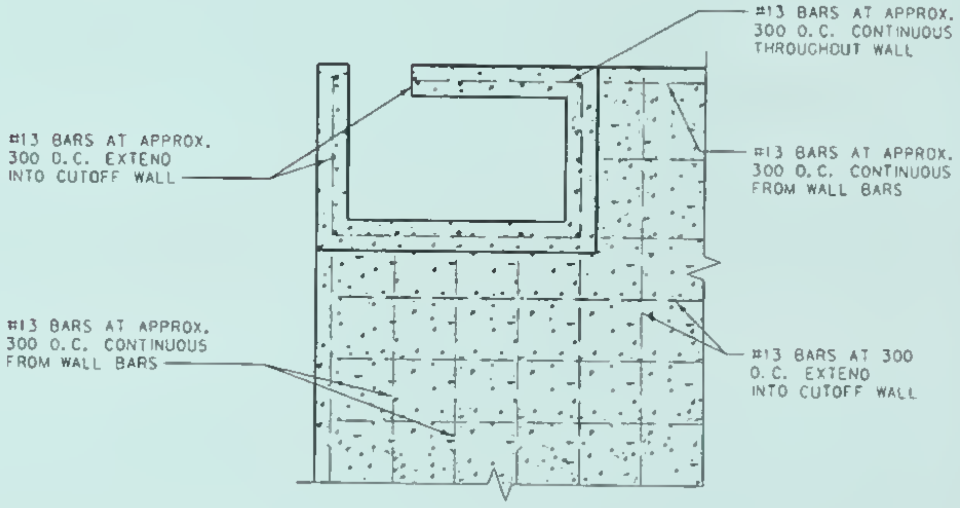
PLAN
TYPE I



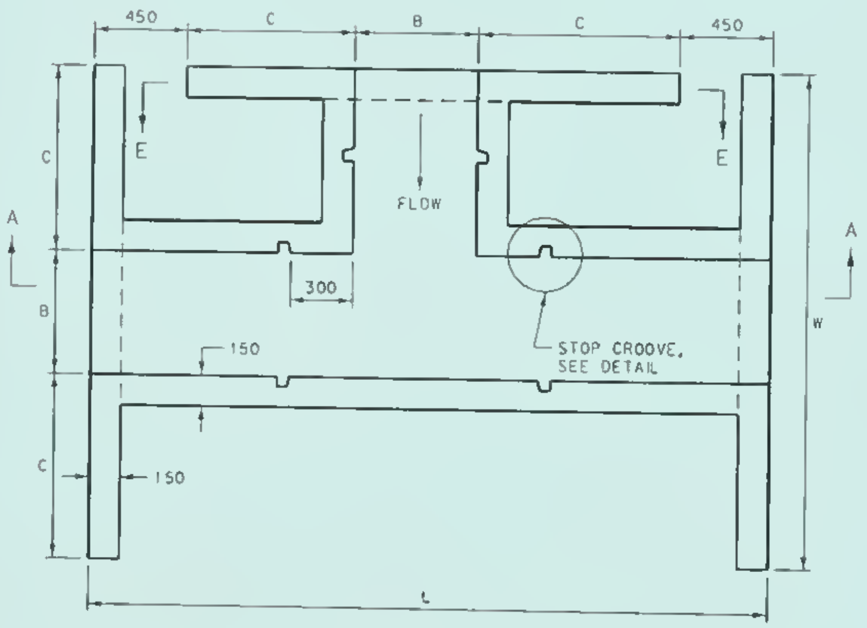
PLAN
TYPE II



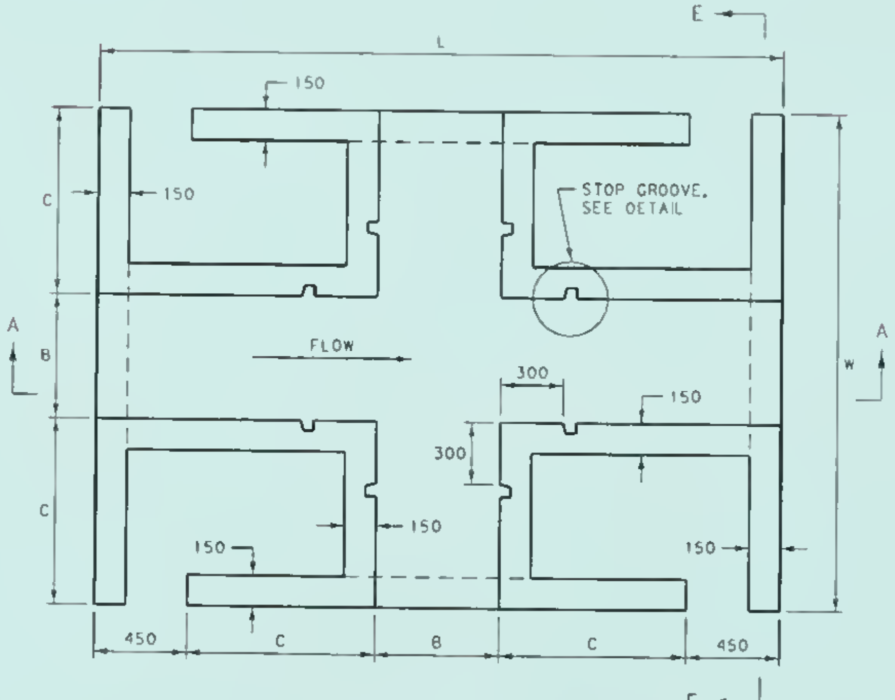
SECTION E-E


#13 BARS AT APPROX. 300 O.C. CONTINUOUS THROUGHOUT WALL
#13 BARS AT APPROX. 300 O.C. EXTEND INTO CUTOFF WALL
#13 BARS AT APPROX. 300 O.C. CONTINUOUS FROM WALL BARS
#13 BARS AT APPROX. 300 O.C. CONTINUOUS FROM WALL BARS
#13 BARS AT 300 O.C. EXTEND INTO CUTOFF WALL

SECTION F-F

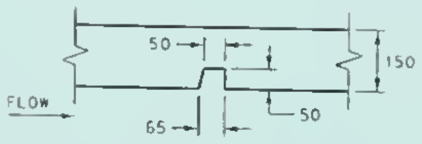


PLAN
TYPE III

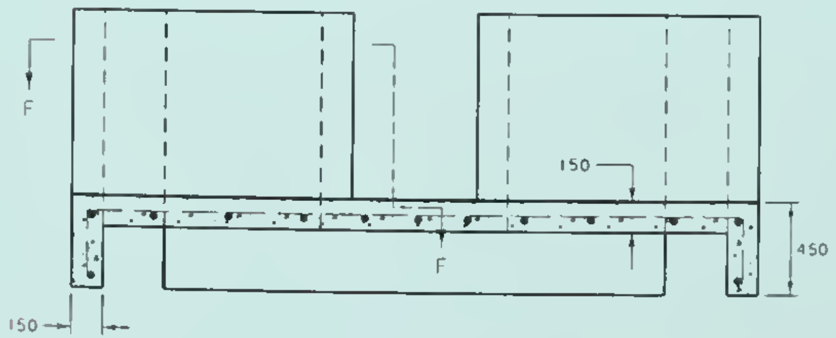


PLAN
TYPE IV

DIMENSIONS AND QUANTITIES							
	B	C	H	L	W	"DD" CONC OR EQUAL (m 3)	REINF. STEEL (kg)
TYPE I	600	900	600	1850	2400	1.1	54.7
	750	1050	600	1850	2850	1.3	60.7
	900	1200	750	1850	3300	1.6	80.2
TYPE II	600	900	600	2850	2400	1.4	69.8
	750	1050	600	3300	2850	1.8	84.2
	900	1200	750	3750	3300	2.4	118.1
TYPE III	600	900	600	3300	2400	2.0	98.7
	750	1050	600	3750	2850	2.5	117.6
	900	1200	750	4200	3300	3.3	164.3
TYPE IV	600	900	600	3300	2400	2.5	121.1
	750	1050	600	3750	2850	3.0	144.4
	900	1200	750	4200	3300	4.1	201.9



STOP GROOVE DETAIL



SECTION A-A

NOTES:

DIVISION BOX MAY BE MODIFIED IF DESIRED WITH DIMENSIONS SHOWN ON THE PLANS.

QUANTITIES ARE FOR ESTIMATING PURPOSES ONLY.

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 552, 615
DWG. NO.
615-04

STANDARD CONCRETE
IRRIGATION DIVISION BOXES

EFFECTIVE: AUGUST 1999
MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

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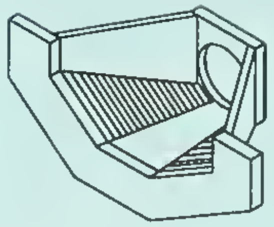
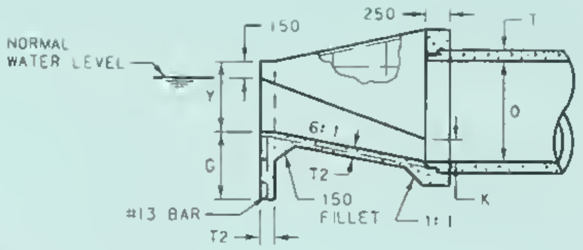


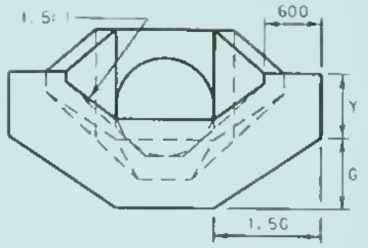
ISOMETRIC VIEW OF TRANSITION

PLACE REBAR IN CENTER OF WALLS, SLAB, ETC. UNLESS OTHERWISE SPECIFIED.

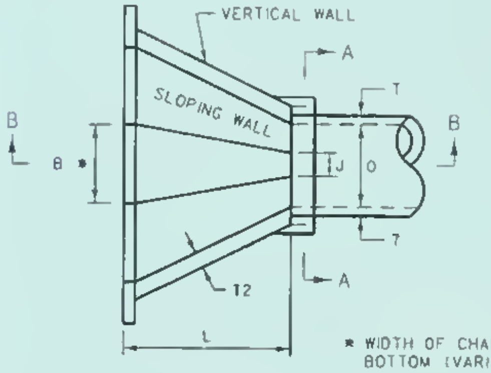


SECTION B-B

SPACE REINFORCING BARS APPROX. 300 mm EACH WAY THROUGHOUT STRUCTURE. USE CONTINUOUS BARS IN FLOORS AND WALLS WHENEVER POSSIBLE. WHEN SPLICES ARE MADE, LAP REINFORCING BAR 450 mm.

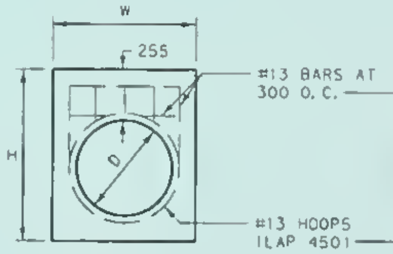


ELEVATION

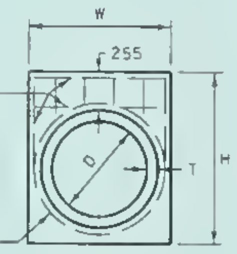


* WIDTH OF CHANNEL BOTTOM (VARIABLE - SEE TABLE)

PLAN VIEW



SECTION A-A
FOR CSP



SECTION A-A
FOR RCP

CHAMFER ALL EXPOSED CORNERS TO 25 mm.

INLET AND OUTLET CONCRETE TRANSITIONS FOR CSP

CULVERT		DIMENSIONS								QUANTITIES								
										B = 0			B = O + 300			B = O + 600		
DIA. D	AREA (m^2)	J	H	L	T2	W	K	Y	G	B	CL "DD" CONC. (m^3)	#13 REBAR (kg)	B	CL "DD" CONC. (m^3)	#13 REBAR (kg)	B	CL "DD" CONC. (m^3)	#13 REBAR (kg)
450	0.159	140	1050	900	150	850	105	380	600	450	0.6	31.3	750	0.7	33.6	1050	0.7	36.3
600	0.283	180	1250	1200	150	1000	140	460	600	600	0.9	43.5	900	1.0	46.3	1200	1.0	49.0
750	0.442	240	1400	1500	150	1100	180	530	600	750	1.2	55.3	1050	1.2	58.5	1350	1.3	61.7
900	0.636	275	1550	1800	150	1300	210	610	750	900	1.6	75.8	1200	1.7	78.9	1500	1.7	83.5
1050	0.866	310	1750	2100	150	1500	240	690	750	1050	2.0	90.7	1350	2.1	95.7	1650	2.2	100.2
1200	1.131	365	1900	2400	200	1600	280	760	750	1200	3.1	116.6	1500	3.2	121.1	1800	3.4	125.2

INLET AND OUTLET CONCRETE TRANSITIONS FOR RCP

CULVERT		DIMENSIONS									QUANTITIES								
											B = 0			B = O + 300			B = O + 600		
DIA. D	AREA (m^2)	J	H	L	T	T2	W	K	Y	G	B	CL "DD" CONC. (m^3)	#13 REBAR (kg)	B	CL "DD" CONC. (m^3)	#13 REBAR (kg)	B	CL "DD" CONC. (m^3)	#13 REBAR (kg)
450	0.164	140	1100	900	63.5	150	970	105	380	600	450	0.6	33.6	750	0.7	36.3	1050	0.8	38.6
600	0.292	185	1300	1200	76.2	150	1150	140	460	600	600	0.9	45.4	900	1.0	48.1	1200	1.0	50.8
750	0.456	230	1500	1500	88.9	150	1320	175	530	600	750	1.2	57.6	1050	1.3	60.8	1350	1.4	64.0
900	0.657	275	1700	1800	101.6	150	1500	215	610	750	900	1.6	78.9	1200	1.7	82.1	1500	1.8	86.6
1050	0.894	325	1900	2100	114.3	150	1680	245	690	750	1050	2.1	96.2	1350	2.1	100.7	1650	2.2	105.2
1200	1.167	370	2050	2400	127.0	200	1860	280	760	750	1200	3.1	121.1	1500	3.3	125.6	1800	3.4	130.2

NOTES:

INSTALL STRUCTURES OUTSIDE THE CLEAR ZONE.

PROVIDE TRASHRACKS WHEN REQUIRED. SEE DTL. DWG. NO. 615-02.

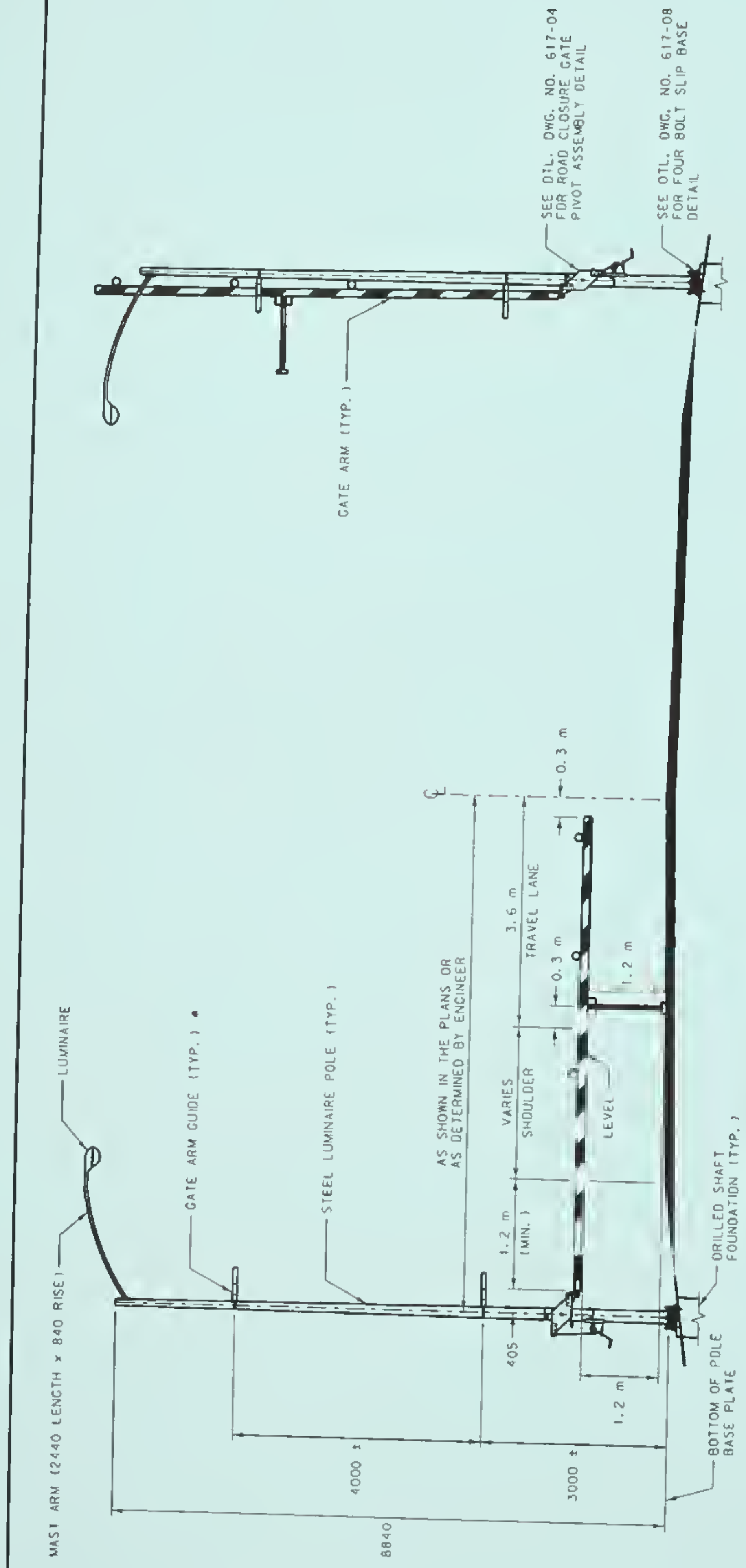
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 615
DWG. NO.
615-06

CONCRETE IRRIGATION INLET
AND OUTLET TRANSITION FOR
[illegible]

EFFECTIVE: AUGUST 1999

MDT *MONTANA DEPARTMENT OF TRANSPORTATION*
MONTANA CADD


SEE DTL. DWG. NO. 617-04 FOR ROAD CLOSURE GATE PIVOT ASSEMBLY DETAIL
SEE DTL. DWG. NO. 617-08 FOR FOUR BOLT SLIP BASE DETAIL
GATE ARM (TYP.)
MAST ARM (2440 LENGTH x 840 RISE)
LUMINAIRE
GATE ARM GUIDE (TYP.) *
STEEL LUMINAIRE POLE (TYP.)
AS SHOWN IN THE PLANS OR AS DETERMINED BY ENGINEER
℄
0.3 m
3.6 m
TRAVEL LANE
0.3 m
1.2 m
VARIES
SHOULDER
LEVEL
1.2 m
(MIN.)
405
1.2 m
DRILLED SHAFT FOUNDATION (TYP.)
BOTTOM OF POLE BASE PLATE
4000 ±
3000 ±
8840

TYPICAL RAISED POSITION

TYPICAL LOWERED POSITION

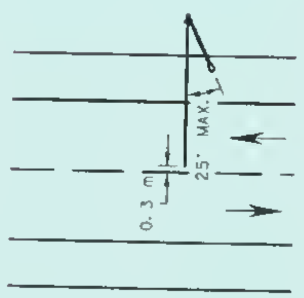
ELEVATION

DIVIDED HIGHWAY INSTALLATION SHOWN

NOTES:

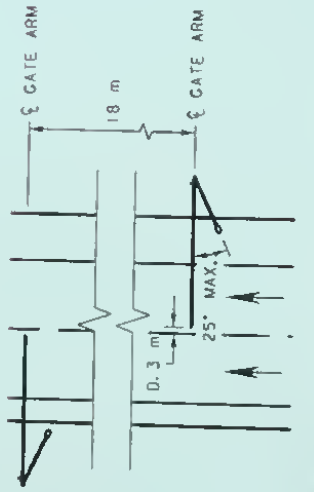
* HEIGHT OF GATE ARM GUIDES MAY VARY AS REQUIRED FOR WARNING LIGHT CLEARANCES.

SEE DTL. DWG. NO. 617-02 FOR ADDITIONAL ROAD CLOSURE GATE DETAILS.



TYPICAL TWO-WAY, TWO-LANE INSTALLATION

(1 GATE REQUIRED)



TYPICAL DIVIDED HIGHWAY INSTALLATION

(2 GATES REQUIRED)

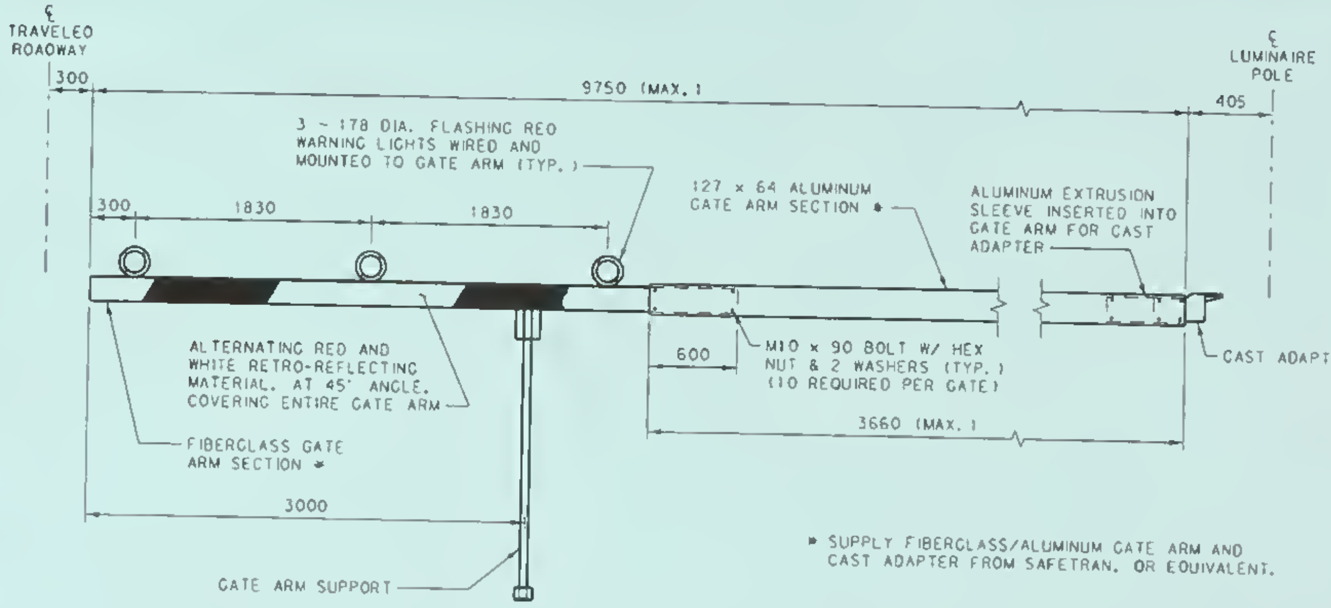
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 617
DWG. NO.
617-00

ROAD CLOSURE GATE

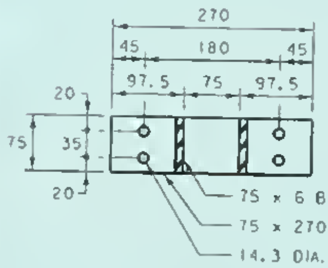
EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD


℄ TRAVELED ROADWAY
℄ LUMINAIRE POLE
300
9750 (MAX.)
405
3 - 178 DIA. FLASHING RED WARNING LIGHTS WIRED AND MOUNTED TO GATE ARM (TYP.)
300
1830
1830
127 x 64 ALUMINUM GATE ARM SECTION *
ALUMINUM EXTRUSION SLEEVE INSERTED INTO GATE ARM FOR CAST ADAPTER
ALTERNATING RED AND WHITE RETRO-REFLECTING MATERIAL, AT 45° ANGLE, COVERING ENTIRE GATE ARM
600
M10 x 90 BOLT W/ HEX NUT & 2 WASHERS (TYP.) (10 REQUIRED PER GATE)
CAST ADAPTER *
3660 (MAX.)
FIBERGLASS GATE ARM SECTION *
3000
GATE ARM SUPPORT

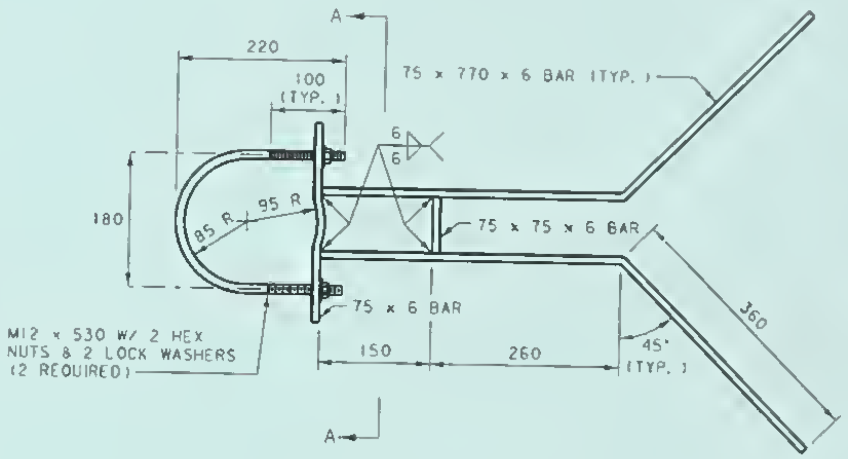
* SUPPLY FIBERGLASS/ALUMINUM GATE ARM AND CAST ADAPTER FROM SAFETRAN, OR EQUIVALENT.

GATE ARM

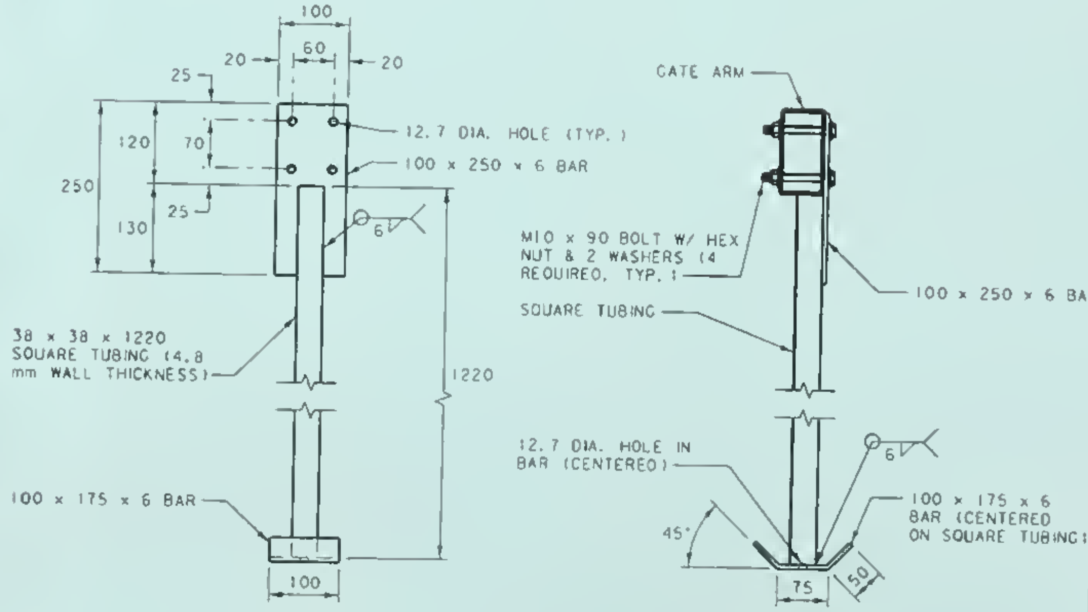


SECTION A-A

(U-BOLTS NOT SHOWN)



GATE ARM GUIDE


100
20
60
20
25
12.7 DIA. HOLE (TYP.)
120
70
100 x 250 x 6 BAR
250
25
130
6
38 x 38 x 1220 SQUARE TUBING (4.8 mm WALL THICKNESS)
1220
100 x 175 x 6 BAR
100
GATE ARM
M10 x 90 BOLT W/ HEX NUT & 2 WASHERS (4 REQUIRED, TYP.)
100 x 250 x 6 BAR
SQUARE TUBING
12.7 DIA. HOLE IN BAR (CENTERED)
6
45°
100 x 175 x 6 BAR (CENTERED ON SQUARE TUBING)
75
50

ELEVATION

(GATE ARM AND BOLTS NOT SHOWN)

RIGHT SIDE

GATE ARM SUPPORT

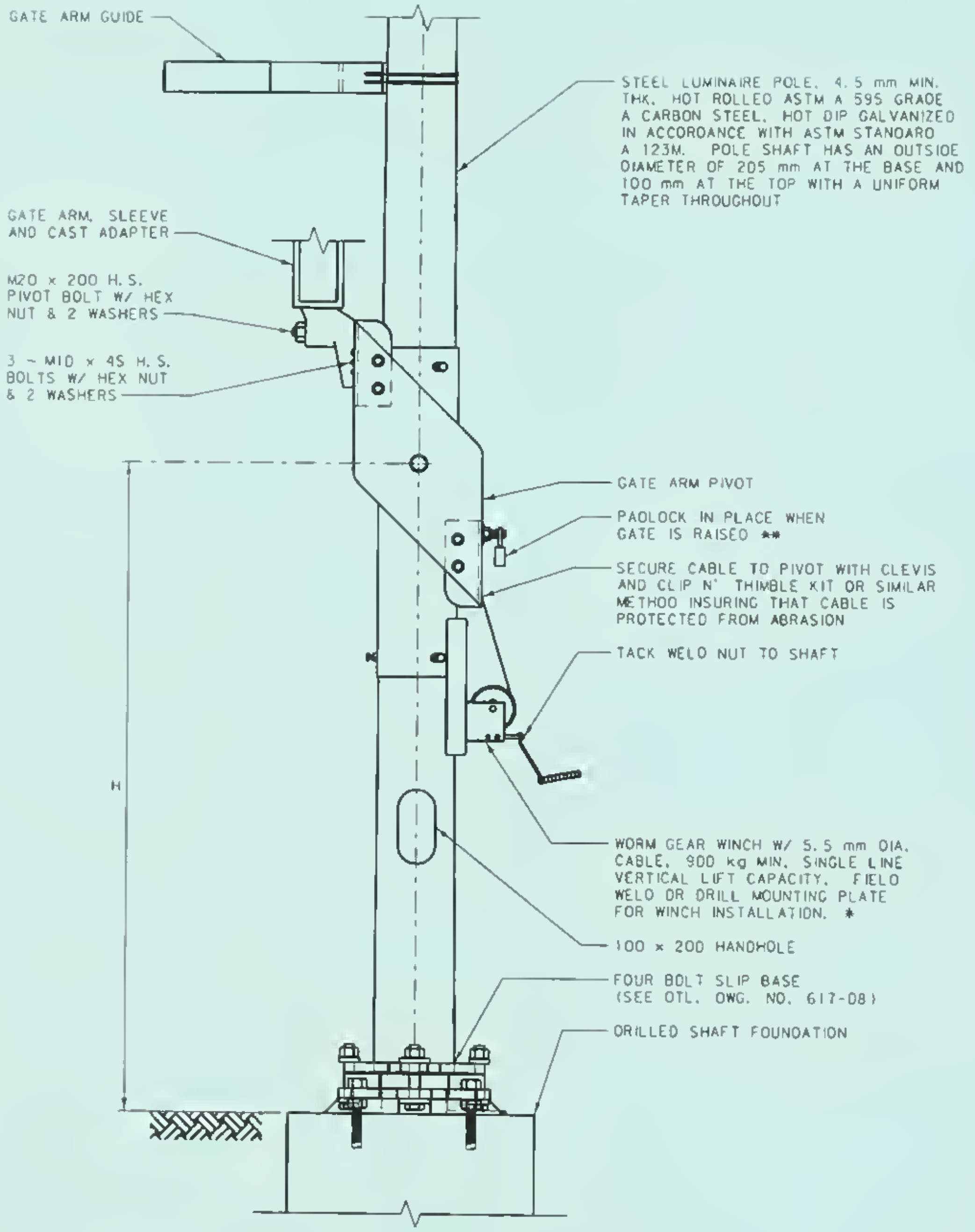
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 617
DWG. NO.
617-02

ROAD CLOSURE GATE DETAILS

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD


GATE ARM GUIDE
STEEL LUMINAIRE POLE, 4.5 mm MIN. THK. HOT ROLLED ASTM A 595 GRADE A CARBON STEEL, HOT DIP GALVANIZED IN ACCORDANCE WITH ASTM STANDARD A 123M. POLE SHAFT HAS AN OUTSIDE DIAMETER OF 205 mm AT THE BASE AND 100 mm AT THE TOP WITH A UNIFORM TAPER THROUGHOUT
GATE ARM, SLEEVE AND CAST ADAPTER
M20 × 200 H.S. PIVOT BOLT W/ HEX NUT & 2 WASHERS
3 ~ M10 × 45 H.S. BOLTS W/ HEX NUT & 2 WASHERS
GATE ARM PIVOT
PADLOCK IN PLACE WHEN GATE IS RAISED **
SECURE CABLE TO PIVOT WITH CLEVIS AND CLIP N' THIMBLE KIT OR SIMILAR METHOD INSURING THAT CABLE IS PROTECTED FROM ABRASION
TACK WELD NUT TO SHAFT
H
WORM GEAR WINCH W/ 5.5 mm DIA. CABLE, 900 kg MIN. SINGLE LINE VERTICAL LIFT CAPACITY. FIELD WELD OR DRILL MOUNTING PLATE FOR WINCH INSTALLATION. *
100 × 200 HANDHOLE
FOUR BOLT SLIP BASE (SEE DTL. DWG. NO. 617-08)
DRILLED SHAFT FOUNDATION

ROAD CLOSURE GATE
PIVOT ASSEMBLY

NOTES:

SEE DTL. DWG. NO. 617-06 FOR PIVOT ASSEMBLY DETAILS.

MOUNTING HEIGHT (H) WILL BE SHOWN IN THE PLANS OR SPECIFIED BY THE ENGINEER TO PROVIDE FOR THE PROPER HEIGHT OF THE GATE ABOVE THE ROADWAY.

ALL BOLTS ARE TO CONFORM TO ASTM F 568M CLASS 4.6, UNLESS DESIGNATED H.S. (HIGH STRENGTH), WHICH ARE TO CONFORM TO ASTM A 325M. AFTER ROAD CLOSURE GATE ASSEMBLY, PAINT ALL EXPOSED BOLT THREADS OR DAMAGE TO THE GALVANIZING WITH TWO COATS OF ZINC RICH PAINT CONFORMING TO ASTM A 780.

* SUPPLY WORM GEAR WINCH AND CABLE FROM DUTTON - LAINSON (STOCK NUMBER 42183), OR EQUIVALENT.

** WHEN THE GATE IS FULLY RAISED, PLACE THE NUT AND WASHER SNUGLY AGAINST THE OUTSIDE OF THE REAR CHANNEL AND PADLOCK IN PLACE. SUPPLY ONE HEAVY, WEATHERPROOF PADLOCK WITH 2 KEYS FOR EACH GATE ARM PIVOT. KEY PAIRED PIVOTS (DIVIDED HIGHWAY INSTALLATION) ALIKE.

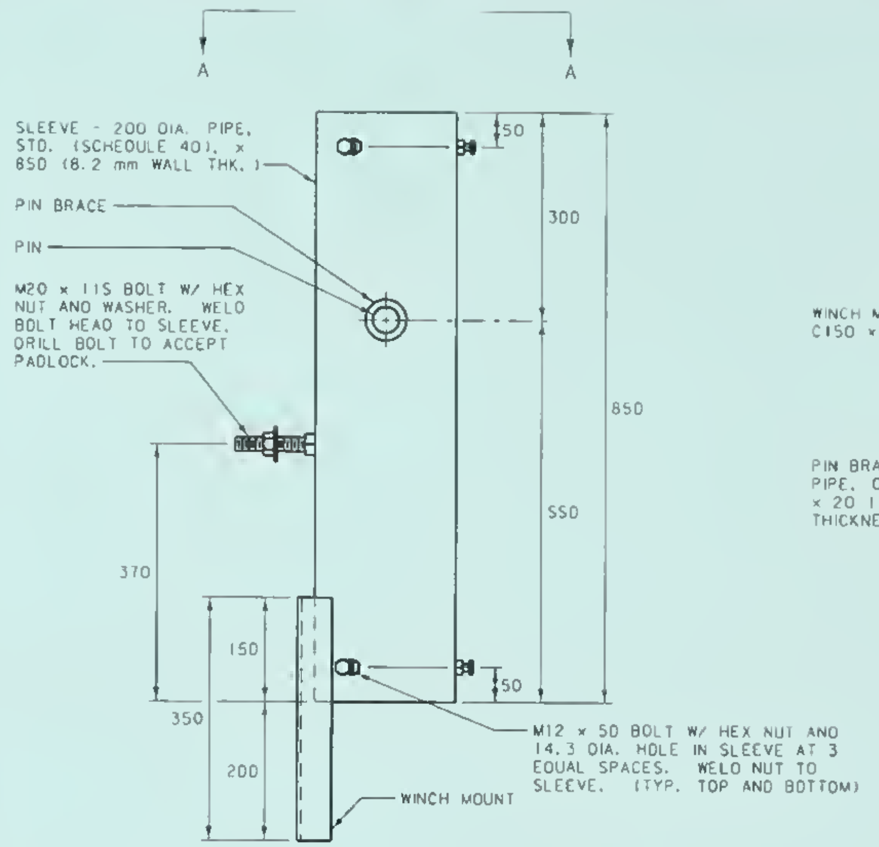
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 617
DWG. NO.
617-04

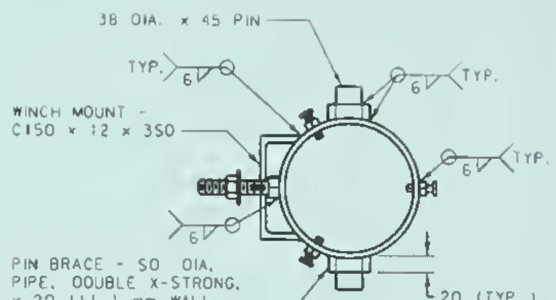
ROAD CLOSURE GATE
PIVOT ASSEMBLY

EFFECTIVE: AUGUST 1999

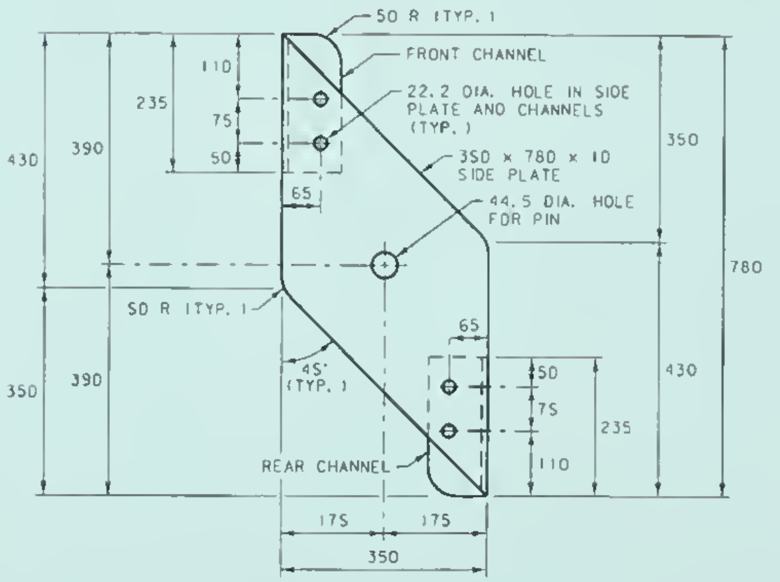
MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD


A
A
SLEEVE - 200 DIA. PIPE, STD. (SCHEDULE 40), × 850 (8.2 mm WALL THK.)
PIN BRACE
PIN
M20 × 115 BOLT W/ HEX NUT AND WASHER. WELD BOLT HEAD TO SLEEVE. DRILL BOLT TO ACCEPT PADLOCK.
50
300
850
550
370
150
350
200
50
WINCH MOUNT
M12 × 50 BOLT W/ HEX NUT AND 14.3 DIA. HOLE IN SLEEVE AT 3 EQUAL SPACES. WELD NUT TO SLEEVE. (TYP. TOP AND BOTTOM)

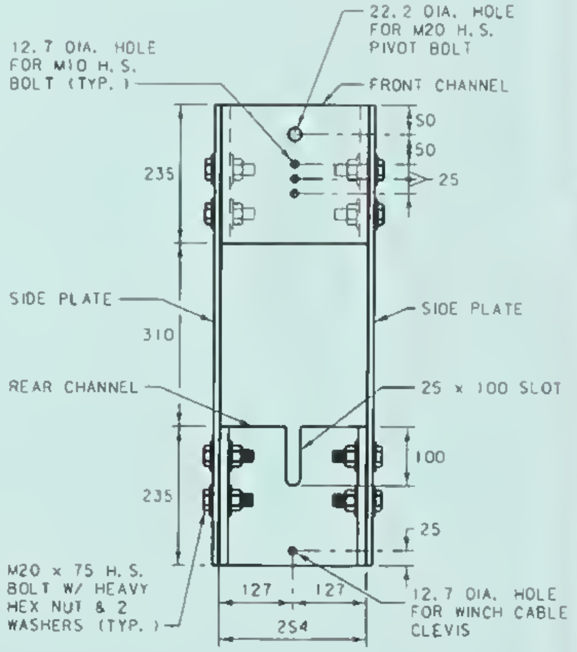
PIVOT SLEEVE


38 DIA. × 45 PIN
TYP.
6
TYP.
6
WINCH MOUNT - C150 × 12 × 350
TYP.
6
6
PIN BRACE - 50 DIA. PIPE, DOUBLE X-STRONG, × 20 (11.1 mm WALL THICKNESS) TYP.
20 (TYP.)

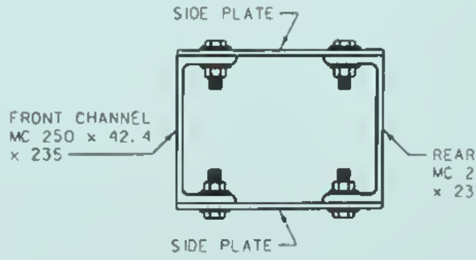
VIEW A-A



ELEVATION


12.7 DIA. HOLE FOR M10 H.S. BOLT (TYP.)
22.2 DIA. HOLE FOR M20 H.S. PIVOT BOLT
FRONT CHANNEL
50
50
25
235
SIDE PLATE
310
SIDE PLATE
REAR CHANNEL
25 × 100 SLOT
100
235
25
M20 × 75 H.S. BOLT W/ HEAVY HEX NUT & 2 WASHERS (TYP.)
127
127
254
12.7 DIA. HOLE FOR WINCH CABLE CLEVIS

END VIEW


SIDE PLATE
FRONT CHANNEL MC 250 × 42.4 × 235
REAR CHANNEL MC 250 × 42.4 × 235
SIDE PLATE

PLAN

SIDE PLATE

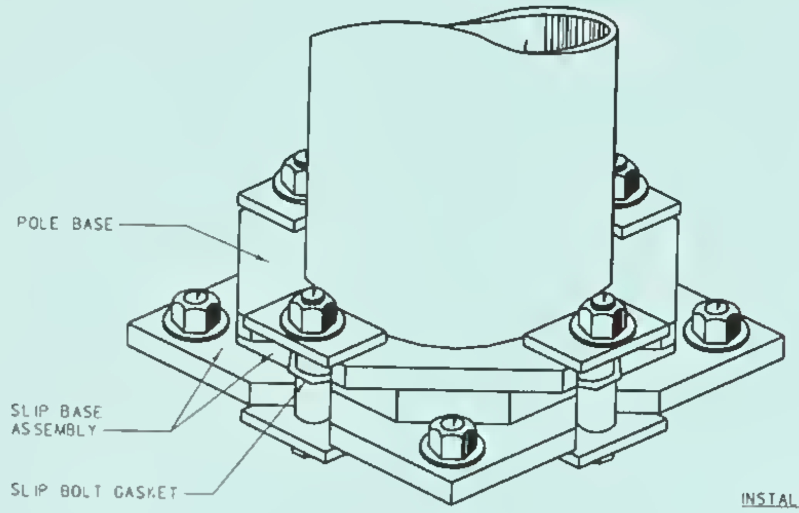
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 617
DWG. NO.
617-06

ROAD CLOSURE GATE
PIVOT ASSEMBLY
DETAILS

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



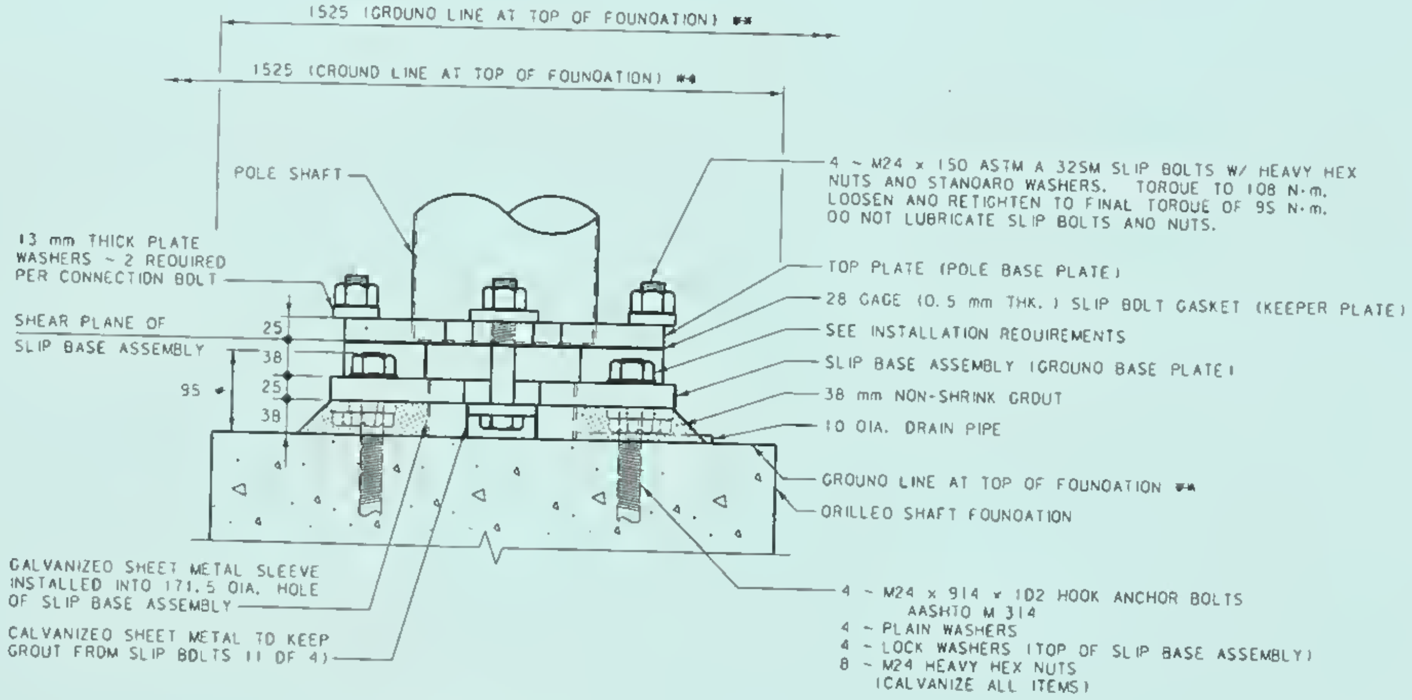
ISOMETRIC VIEW

* TOP OF ANCHOR BOLTS MUST BE BELOW SHEAR PLANE.

** IT IS CRITICAL THAT THE GROUND SURROUNDING THE CONCRETE FOUNDATION BE GRADED AND CONTOURED TO PREVENT VEHICLE UNDERCARRIAGE SNAGGING. ALL POINTS ON THE GROUND SURFACE ARE TO BE AT THE TOP OF THE FOUNDATION WITHIN ANY 1525 mm HORIZONTAL DISTANCE EXTENDING OVER THE SLIP BASE AS SHOWN, AND ALIGNING PERPENDICULAR TO THE ROADWAY CENTERLINE OR ON A RADIAL LINE FOR A CURVED ROADWAY.

INSTALLATION REQUIREMENTS FOR TOP NUTS OF ANCHOR BOLTS

FIELD LUBRICATE BEARING FACE AND THREADS OF TOP ANCHOR BOLT NUTS WITH A STICK WAX. TIGHTEN TOP NUTS TO SNUG-TIGHT. SNUG-TIGHT IS DEFINED AS THE TIGHTNESS THAT EXISTS WHEN THE GROUND BASE PLATE IS IN FIRM CONTACT WITH THE TOP AND BOTTOM NUTS, AND IS ATTAINED BY THE FULL EFFORT OF A MAN USING AN ORDINARY SPUD WRENCH. AFTER THE SNUG-TIGHT CONDITION IS ATTAINED, ROTATE THE TOP NUTS AN ADDITIONAL 45° (+20°, -0°).


1525 (GROUND LINE AT TOP OF FOUNDATION) **
1525 (GROUND LINE AT TOP OF FOUNDATION) **
POLE SHAFT
13 mm THICK PLATE WASHERS ~ 2 REQUIRED PER CONNECTION BOLT
SHEAR PLANE OF SLIP BASE ASSEMBLY
25
38
95 *
25
38
4 ~ M24 x 150 ASTM A 325M SLIP BOLTS W/ HEAVY HEX NUTS AND STANDARD WASHERS. TORQUE TO 108 N·m. LOOSEN AND RETIGHTEN TO FINAL TORQUE OF 95 N·m. DO NOT LUBRICATE SLIP BOLTS AND NUTS.
TOP PLATE (POLE BASE PLATE)
28 GAGE (0.5 mm THK.) SLIP BOLT GASKET (KEEPER PLATE)
SEE INSTALLATION REQUIREMENTS
SLIP BASE ASSEMBLY (GROUND BASE PLATE)
38 mm NON-SHRINK GROUT
10 DIA. DRAIN PIPE
GROUND LINE AT TOP OF FOUNDATION **
DRILLED SHAFT FOUNDATION
GALVANIZED SHEET METAL SLEEVE INSTALLED INTO 171.5 DIA. HOLE OF SLIP BASE ASSEMBLY
GALVANIZED SHEET METAL TO KEEP GROUT FROM SLIP BOLTS (1 OF 4)
4 ~ M24 x 914 x 102 HOOK ANCHOR BOLTS AASHTO M 314
4 ~ PLAIN WASHERS
4 ~ LOCK WASHERS (TOP OF SLIP BASE ASSEMBLY)
8 ~ M24 HEAVY HEX NUTS
(GALVANIZE ALL ITEMS)

FOUR BOLT SLIP BASE

NOTES:

SEE DTL. DWG. NO. 617-10 FOR FOUR BOLT SLIP BASE DETAILS AND DRILLED SHAFT FOUNDATION.

CONFORM SLIP BOLT GASKET (KEEPER PLATE) TO ASTM A 653M GRADE 230 WITH COATING ASTM G 90.

CONFORM ALL PLATES TO ASTM A 709M (GRADE 250) OR AASHTO M 270M.

GALVANIZE ALL STRUCTURAL STEEL AFTER FABRICATION ACCORDING TO ASTM A 123M. ALL CONTACT AREAS OF STRUCTURAL STEEL ARE TO BE FREE OF GALVANIZING BEADS AND RUNS.

ELECTRO-PLATE ALL CONNECTING HARDWARE (HIGH STRENGTH BOLTS, HEAVY HEX NUTS AND STD. WASHERS) WITH CADMIUM IN ACCORDANCE WITH ASTM B 766 CLASS 12.

DO NOT ENCLOSE ANY SLIP BOLT HEADS OR WASHERS IN GROUT AND KEEP THEM COMPLETELY MECHANICALLY ACCESSIBLE, ALLOWING BOLTS TO BE FREELY PUSHED OUT DURING VEHICLE IMPACT.

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 617
DWG. NO.
617-08

FOUR BOLT SLIP BASE

EFFECTIVE: AUGUST 1999

MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

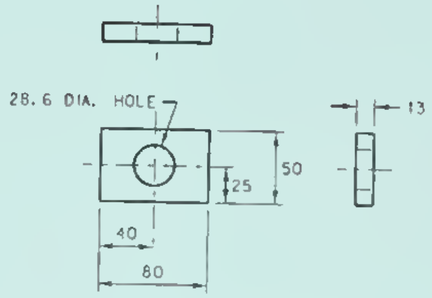
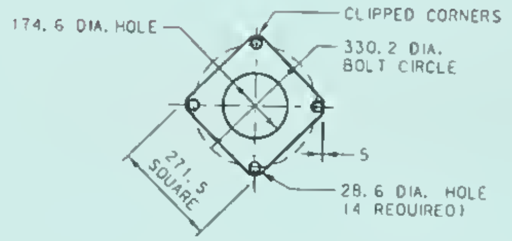
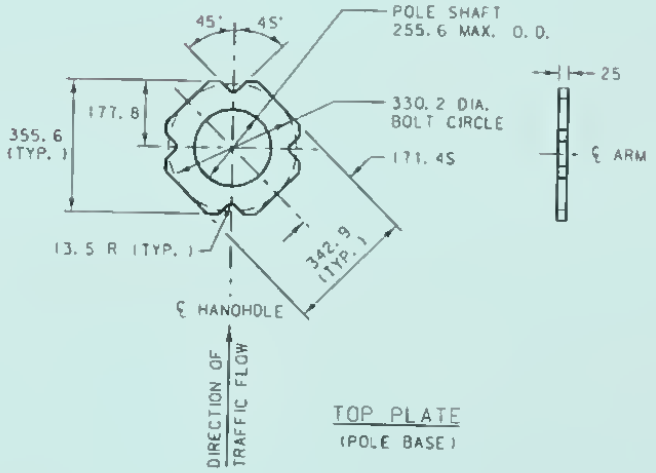


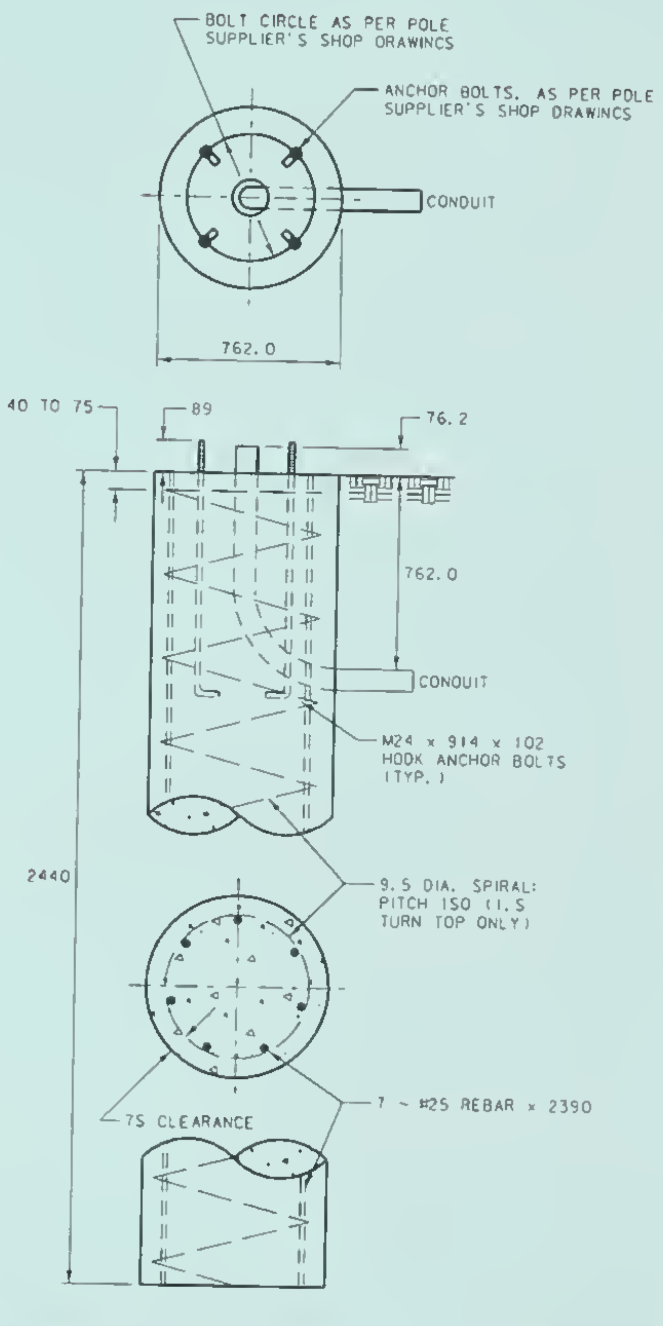
PLATE WASHER



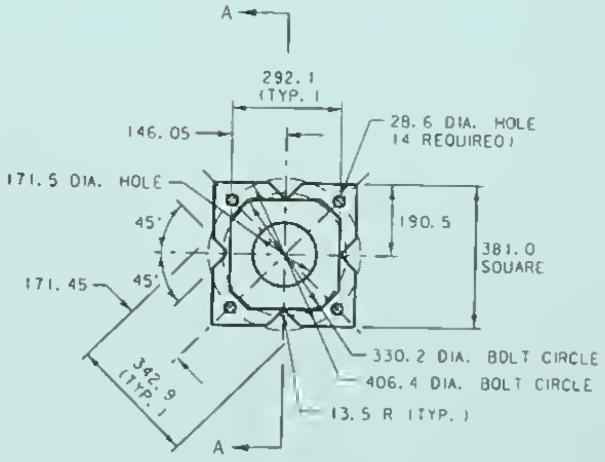
SLIP BOLT GASKET
(KEEPER PLATE)

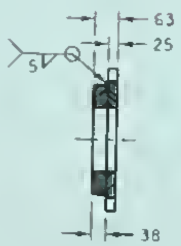


TOP PLATE
(POLE BASE)


BOLT CIRCLE AS PER POLE SUPPLIER'S SHOP DRAWINGS
ANCHOR BOLTS, AS PER POLE SUPPLIER'S SHOP DRAWINGS
CONDUIT
762.0
40 TO 75
89
76.2
762.0
CONDUIT
M24 x 914 x 102 HOOK ANCHOR BOLTS (TYP.)
2440
9.5 DIA. SPIRAL: PITCH 150 (1.5 TURN TOP ONLY)
75 CLEARANCE
7 ~ #25 REBAR x 2390

DRILLED SHAFT FOUNDATION
(LUMINAIRE POLE)





SECTION A-A

SLIP BASE ASSEMBLY
(GROUND BASE PLATE)

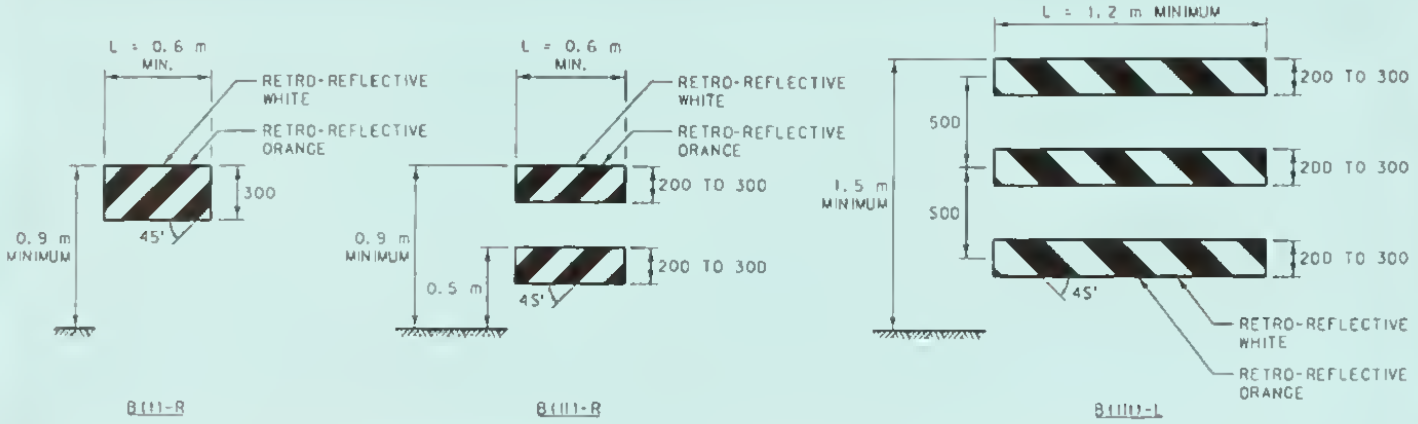
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 617
DWG. NO.
617-10

FOUR BOLT SLIP BASE DETAILS

EFFECTIVE: AUGUST 1999

MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



RAIL STRIPES ARE 150 mm IN WIDTH FOR BARRICADES 0.9 m OR GREATER IN LENGTH. FOR BARRICADES LESS THAN 0.9 m IN LENGTH, 100 mm STRIPES MAY BE USED.

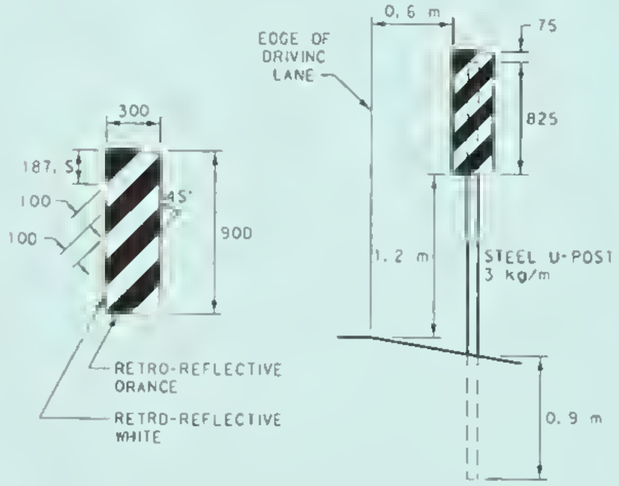
THE PREDOMINANT COLOR FOR OTHER BARRICADE COMPONENTS IS WHITE, BUT UNPAINTED GALVANIZED METAL OR ALUMINUM COMPONENTS MAY BE USED.

WHERE B(III) BARRICADES ARE TO FACE TRAFFIC FROM TWO DIRECTIONS, STRIPING ON BOTH THE FRONT AND REAR SIDES IS REQUIRED.

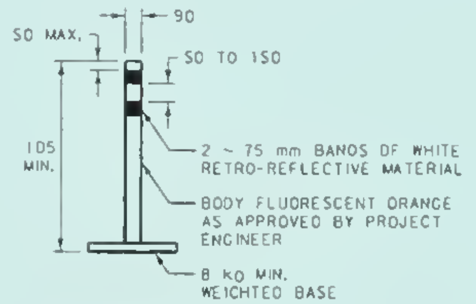
MATERIALS ACCEPTABLE FOR BARRICADE FRAMEWORK INCLUDE WOOD, LIGHTWEIGHT YIELDING METAL AND LIGHTWEIGHT YIELDING PLASTIC. WOOD USED IN FRAMEWORK FOR BARRICADES MAY NOT EXCEED 50 x 100 IN SIZE. USE STANDARD GRADE (NO. 2) OR BETTER S4S LUMBER.

USE SANDBAGS OF SUFFICIENT WEIGHT TO HOLD THE BARRICADES IN PLACE. WATERPROOF SANDBAGS DURING PERIODS OF FREEZING WEATHER.

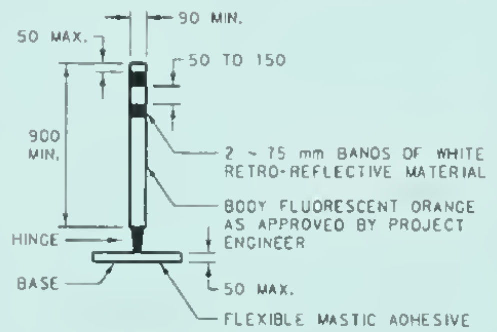
PORTABLE BARRICADES



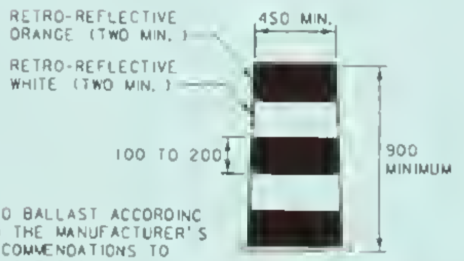
VERTICAL PANEL
(VP-1R SHOWN. REVERSE FOR VP-1L.)


90
50 MAX.
50 TO 150
105 MIN.
2 ~ 75 mm BANDS OF WHITE RETRO-REFLECTIVE MATERIAL
BODY FLUORESCENT ORANGE AS APPROVED BY PROJECT ENGINEER
8 kg MIN. WEIGHTED BASE

GUIDE POST


90 MIN.
50 MAX.
50 TO 150
900 MIN.
2 ~ 75 mm BANDS OF WHITE RETRO-REFLECTIVE MATERIAL
BODY FLUORESCENT ORANGE AS APPROVED BY PROJECT ENGINEER
HINGE
BASE
50 MAX.
FLEXIBLE MASTIC ADHESIVE

FLEXIBLE GUIDE POST
(SELF RIGHTING AFTER IMPACT)


RETRO-REFLECTIVE ORANGE (TWO MIN.)
RETRO-REFLECTIVE WHITE (TWO MIN.)
450 MIN.
100 TO 200
900 MINIMUM

ADD BALLAST ACCORDING TO THE MANUFACTURER'S RECOMMENDATIONS TO HOLD THE DRUM IN PLACE.

DRUMS HAVE CLOSED TOPS.

PLASTIC DRUM

NOTES:

BARRICADES OR VERTICAL PANELS DESIGNATED "R" ARE PLACED TO THE RIGHT SIDE OF APPROACHING TRAFFIC. THOSE DESIGNATED "L" ARE PLACED TO THE LEFT SIDE.

SEE THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD) PART 6 FOR ADDITIONAL INFORMATION.

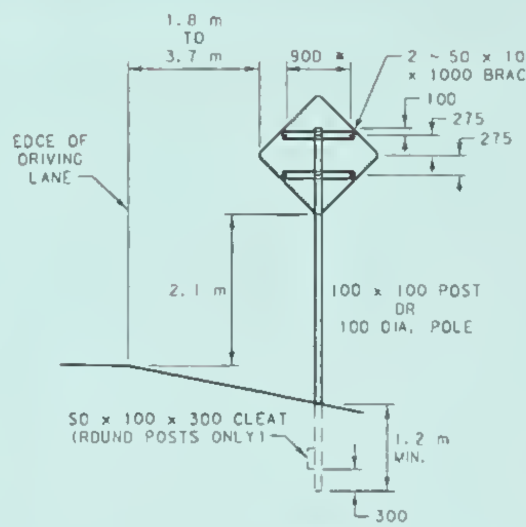
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 618
DWG. NO.
618-00

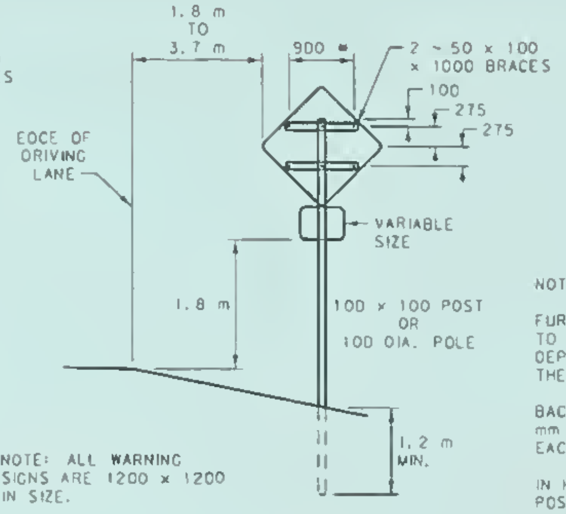
BARRICADES AND
CHANNELIZING DEVICES

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT
OF TRANSPORTATION
MONTANA CADD


1.8 m TO 3.7 m
900 *
2 ~ 50 x 100 x 1000 BRACES
100
275
275
EDGE OF DRIVING LANE
2.1 m
100 x 100 POST OR 100 DIA. POLE
50 x 100 x 300 CLEAT (ROUND POSTS ONLY)
1.2 m MIN.
300

WARNING



NOTE: ALL WARNING SIGNS ARE 1200 x 1200 IN SIZE.

WARNING
WITH SUPPLEMENTAL PANEL

NOTES:

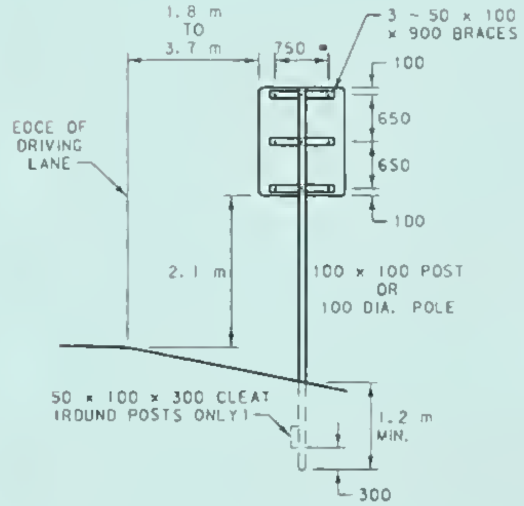
FURNISH POST OR POLE LENGTHS TO ACCOMMODATE THE FOUNDATION DEPTH, THE MOUNTING HEIGHT AND THE MOUNTINGS.

BACKFILL FOUNDATION HOLES IN 205 mm LIFTS, THOROUGHLY TAMPING EACH LIFT.

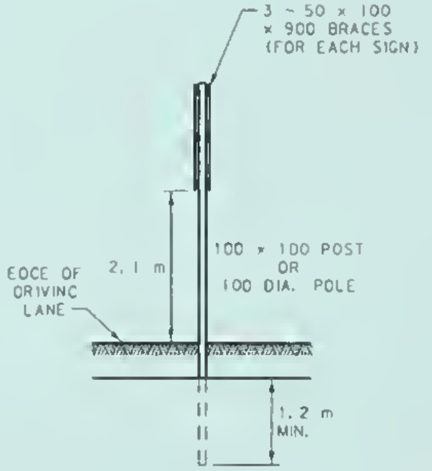
IN HIGH WIND AREAS INSTALL LARGER POSTS OR POLES COMPLYING WITH THE FOUNDATION AND BREAKAWAY REQUIREMENTS OF DTL. DWG. NO. 619-20.

* DIMENSIONS ARE FROM ℄ BOLT TO ℄ BOLT.

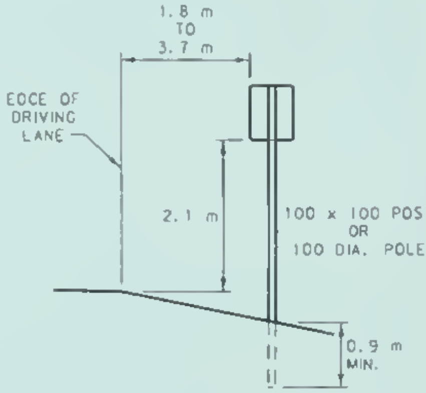
VERTICAL ALIGNMENT OF SIGNS IS TO BE WITHIN 5° OF PLUMB (85 mm IN 1000 mm).


1.8 m TO 3.7 m
750 *
3 ~ 50 x 100 x 900 BRACES
100
650
650
100
EDGE OF DRIVING LANE
2.1 m
100 x 100 POST OR 100 DIA. POLE
50 x 100 x 300 CLEAT (ROUND POSTS ONLY)
1.2 m MIN.
300

REGULATORY
1200 x 1500 PANEL

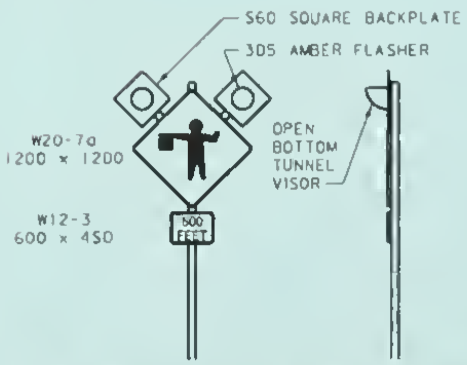

3 ~ 50 x 100 x 900 BRACES (FOR EACH SIGN)
EDGE OF DRIVING LANE
2.1 m
100 x 100 POST OR 100 DIA. POLE
1.2 m MIN.

REGULATORY
1200 x 1500 PANEL
BACK TO BACK

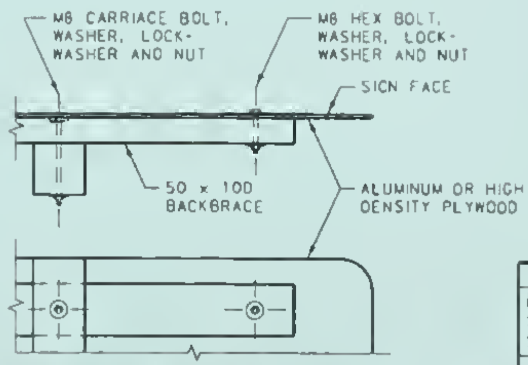


REGULATORY
600 x 750 PANEL

TYPICAL SIGN MOUNTINGS
(FOR CONSTRUCTION SIGNING ONLY)



FLASHING FLAGGER AHEAD SIGN


M8 CARRIAGE BOLT, WASHER, LOCK-WASHER AND NUT
M8 HEX BOLT, WASHER, LOCK-WASHER AND NUT
SIGN FACE
50 x 100 BACKBRACE
ALUMINUM OR HIGH DENSITY PLYWOOD

SIGN FASTENING DETAILS

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 618
DWG. NO.
618-01

CONSTRUCTION SIGN
DETAILS

EFFECTIVE: AUGUST 1999

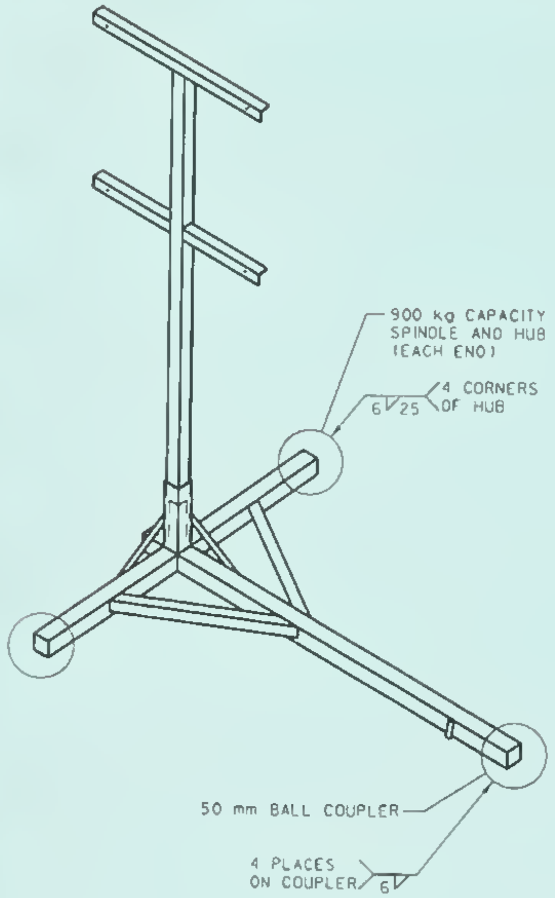
MONTANA DEPARTMENT
OF TRANSPORTATION
MONTANA CADD

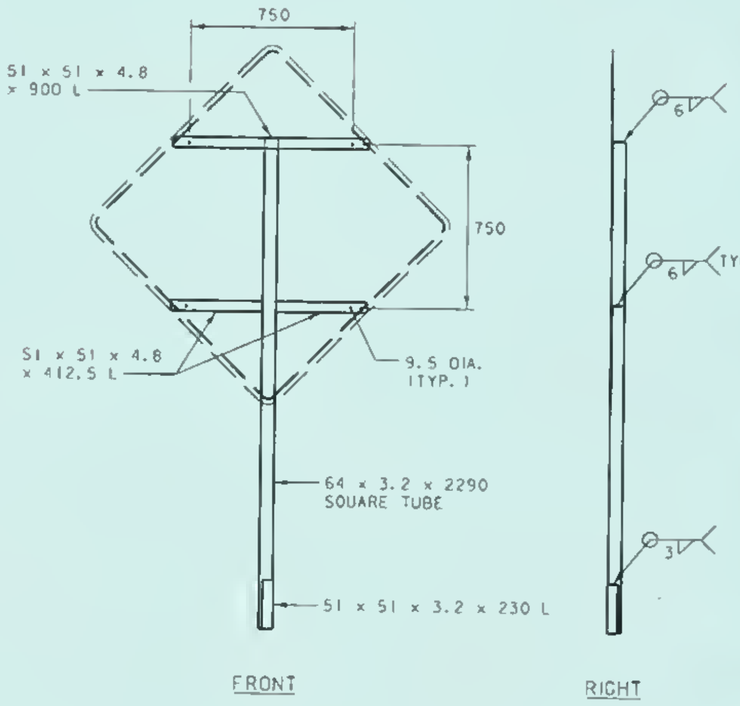
NOTES:

THE MAXIMUM WEIGHT OF THE ASSEMBLY IS 115 kg.

USE A 355 mm WHEEL AND TIRE.

AUTOMOTIVE AND EQUIPMENT AXLE ASSEMBLIES MAY NOT BE USED FOR TRAILER-MOUNTED SIGN SUPPORTS.

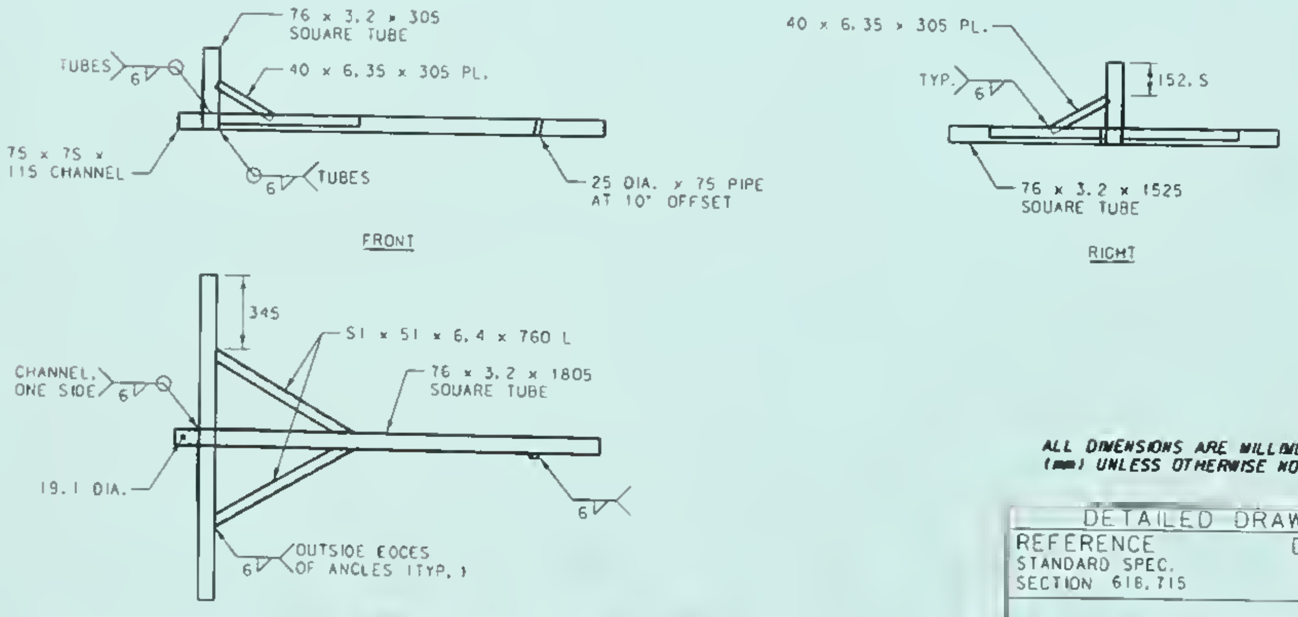




FRONT

RIGHT

SIGN SUPPORT


76 × 3.2 × 305 SQUARE TUBE
TUBES 6
40 × 6.35 × 305 PL.
75 × 75 × 115 CHANNEL
6 TUBES
25 DIA. × 75 PIPE AT 10° OFFSET
40 × 6.35 × 305 PL.
TYP. 6
152.5
76 × 3.2 × 1525 SQUARE TUBE
345
51 × 51 × 6.4 × 760 L
CHANNEL, ONE SIDE 6
76 × 3.2 × 1805 SQUARE TUBE
19.1 DIA.
6
6 OUTSIDE EDGES OF ANGLES (TYP.)

FRONT

RIGHT

TOP

TRAILER

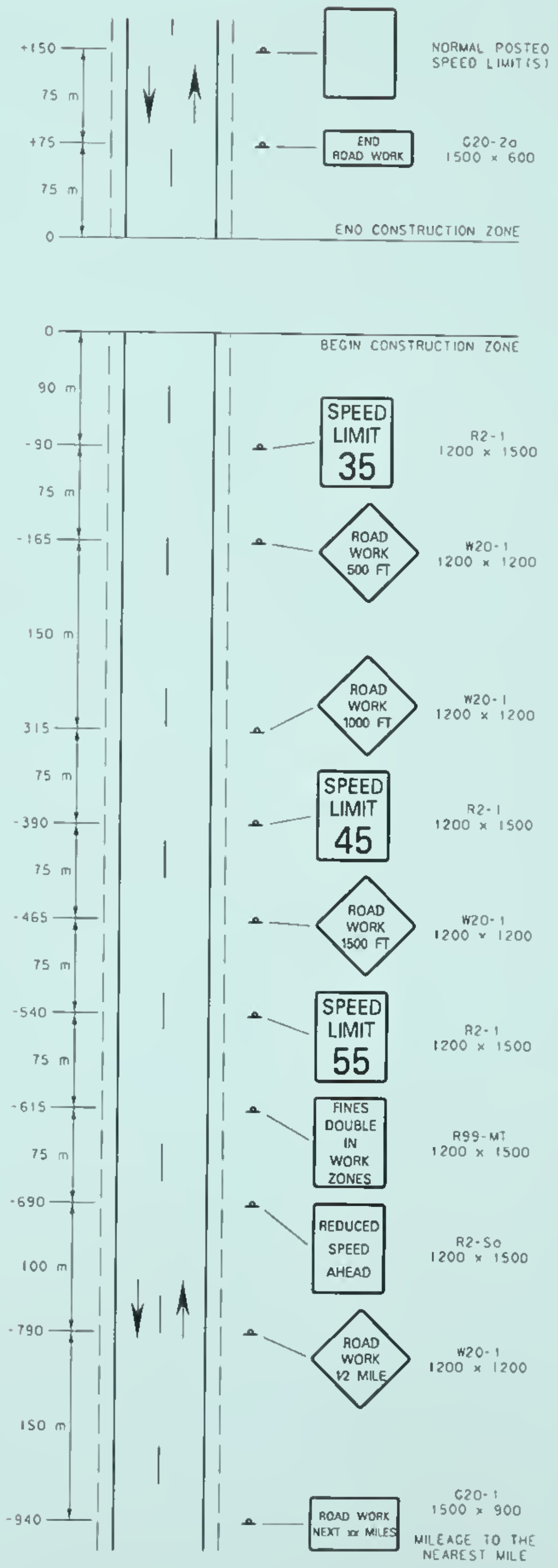
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 618, 715
DWG. NO.
618-02

PORTABLE SIGN
SUPPORT ASSEMBLY

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



NOTES:

THIS SIGN LAYOUT IS INTENDED TO BE A PERMANENT INSTALLATION FOR THE DURATION OF THE PROJECT, AS APPROVED BY THE ENGINEER. OMIT OR COVER SIGNS WHEN NOT IN USE, INCLUDING SPEED LIMIT SIGNS NOT WARRANTED.

INCLUDE REGULATORY SIGNING ONLY IF THE CONSTRUCTION ZONE CONTAINS A WORK ZONE OR HAS ROADWAY CONDITIONS THAT WARRANT SPEED RESTRICTIONS. MODIFY REGULATORY SIGNS TO MATCH ADJACENT REGULATIONS.

OMIT THE G20-1 SIGN ON PROJECTS LESS THAN 3.2 KILOMETERS IN LENGTH.

SET UP THIS SIGN LAYOUT IN EACH TRAFFIC DIRECTION.

THE CONSTRUCTION ZONE REFERS TO THE GENERAL AREA THAT REQUIRES TEMPORARY WORK ZONE TRAFFIC CONTROL.

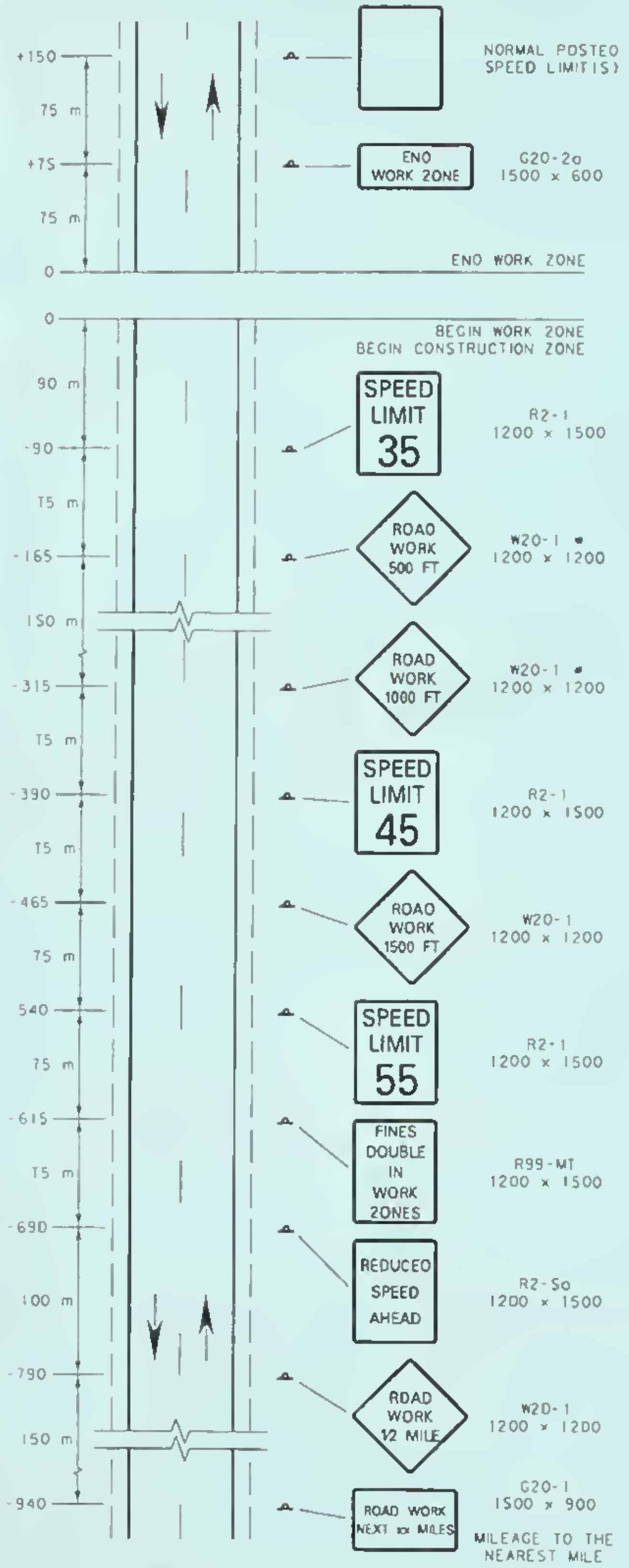
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 618
DWG. NO.
618-04

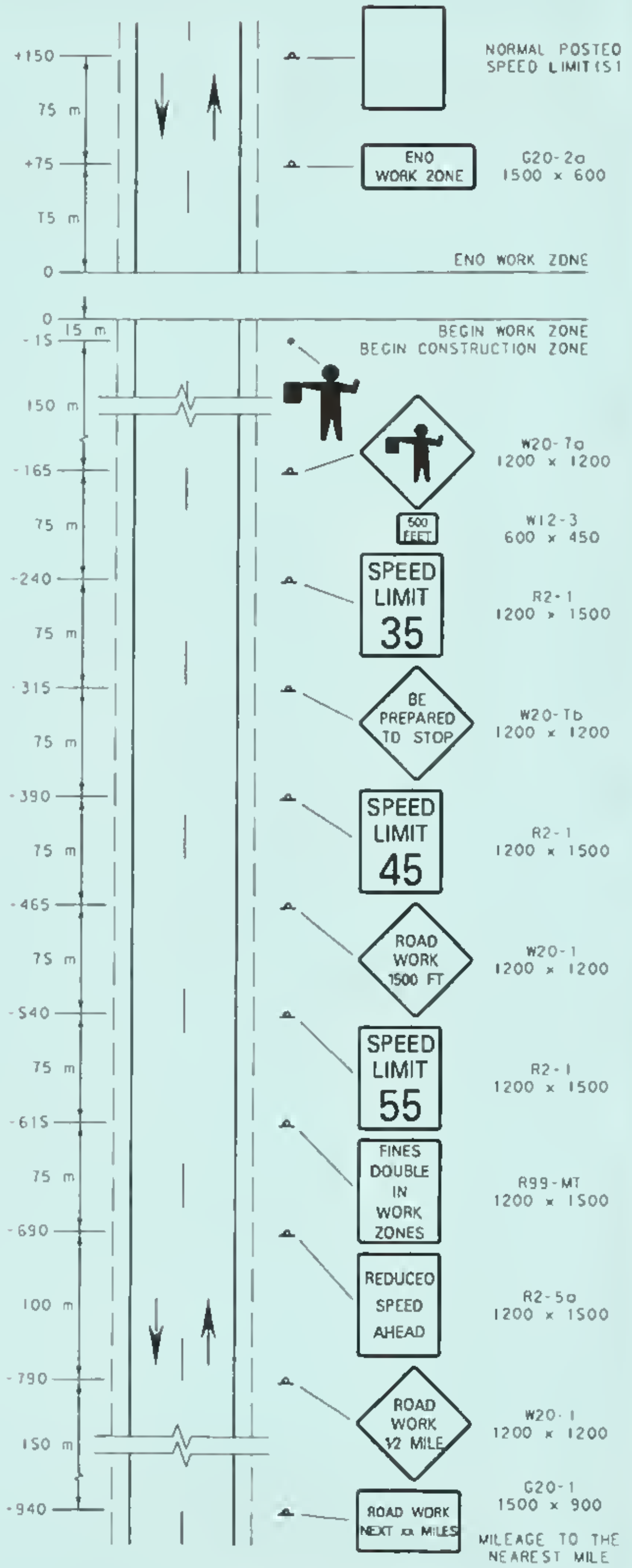
TWO-LANE
PROJECT
CONSTRUCTION ZONE

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



WORK ZONE WITH NO FLAGGER



WORK ZONE WITH FLAGGER

NOTES:

THESE SIGN LAYOUTS WORK IN CONJUNCTION WITH THE PERMANENT LAYOUT ILLUSTRATED ON DTL. DWG. NO. 618-04. COVER OR OMIT SIGNS WHEN NOT IN USE, INCLUDING SPEED LIMIT SIGNS NOT WARRANTED.

INCLUDE REGULATORY SIGNING ONLY IF THERE IS REASON TO RESTRICT SPEED WITHIN THE WORK ZONE. MODIFY REGULATORY SIGNS TO MATCH ADJACENT REGULATIONS.

SEE DTL. DWG. NO. 618-08 "TWO-LANE WORK ZONES WITHIN PROJECT LIMITS" FOR SIGNING THE OPPOSING TRAFFIC DIRECTION.

THE WORK ZONE REFERS TO THE AREA WITHIN THE CONSTRUCTION ZONE WHERE WORK IS ACTUALLY TAKING PLACE.

* USE MORE SPECIFIC SIGNS, WHERE APPLICABLE, SUCH AS W8-3 "PAVEMENT ENDS."

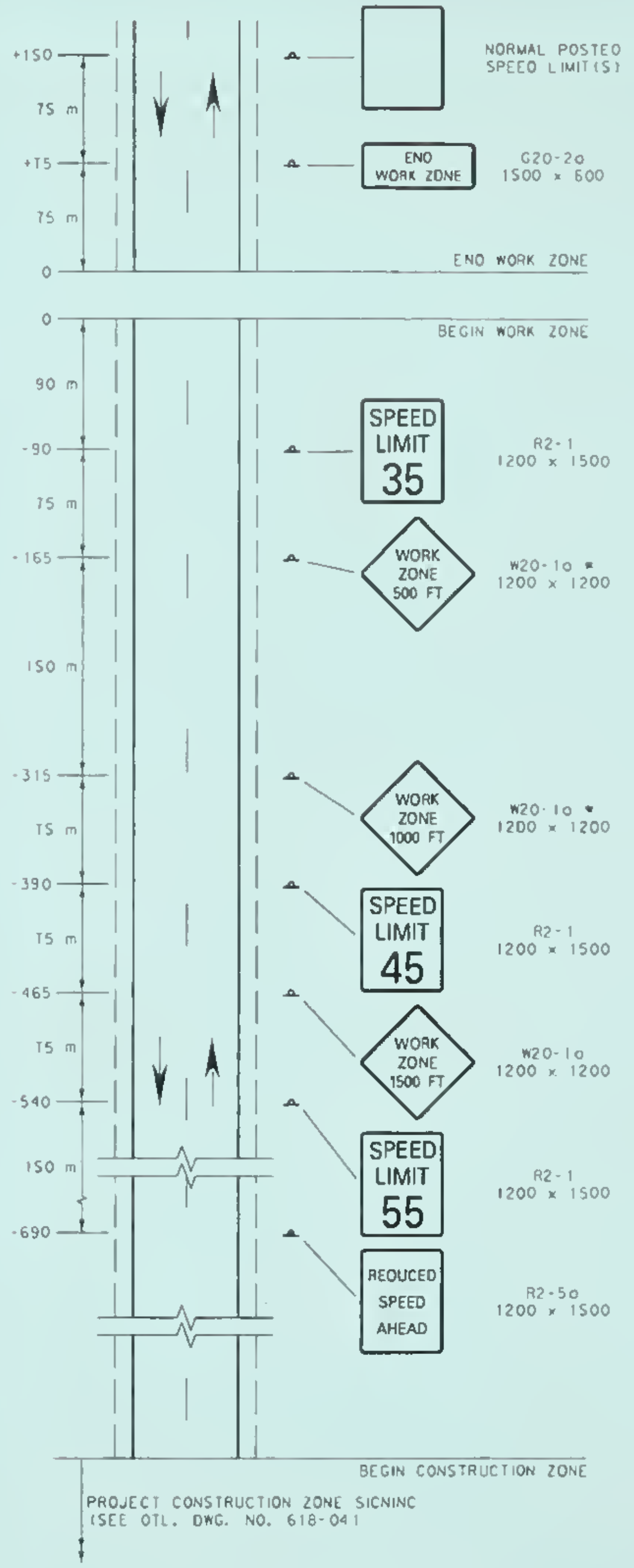
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 618
DWG. NO.
618-06

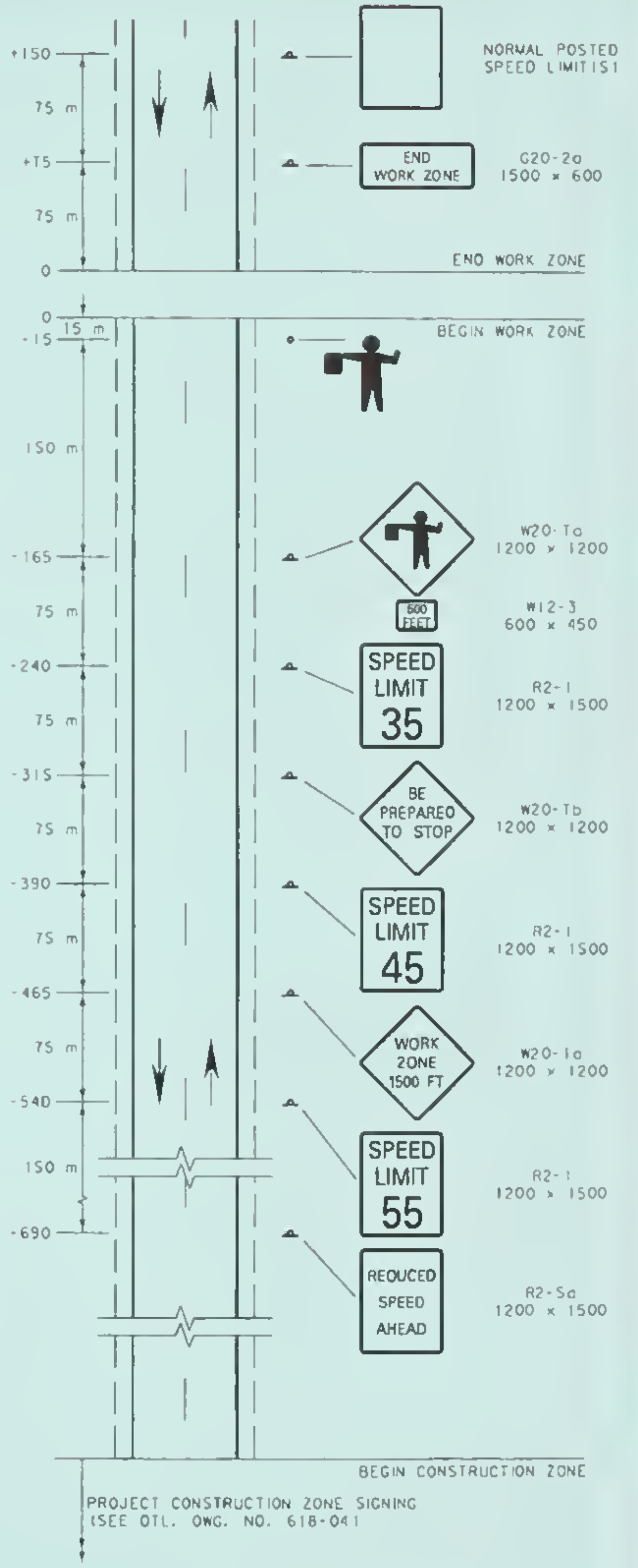
TWO-LANE
WORK ZONES
AT PROJECT LIMIT

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



WORK ZONE WITH NO FLAGGER



WORK ZONE WITH FLAGGER

NOTES:

INCLUDE REGULATORY SIGNING ONLY IF THERE IS REASON TO RESTRICT SPEED WITHIN THE WORK ZONE. MODIFY REGULATORY SIGNS TO MATCH ADJACENT REGULATIONS.

SET UP THIS SIGN LAYOUT IN EACH TRAFFIC DIRECTION. DO NOT LOCATE THESE SIGN LAYOUTS WITHIN 3.2 KILOMETERS OF ANOTHER LAYOUT.

THE WORK ZONE REFERS TO THE AREA WITHIN THE CONSTRUCTION ZONE WHERE WORK IS ACTUALLY TAKING PLACE.

* USE MORE SPECIFIC SIGNS, WHERE APPLICABLE, SUCH AS W8-3 "PAVEMENT ENDS."

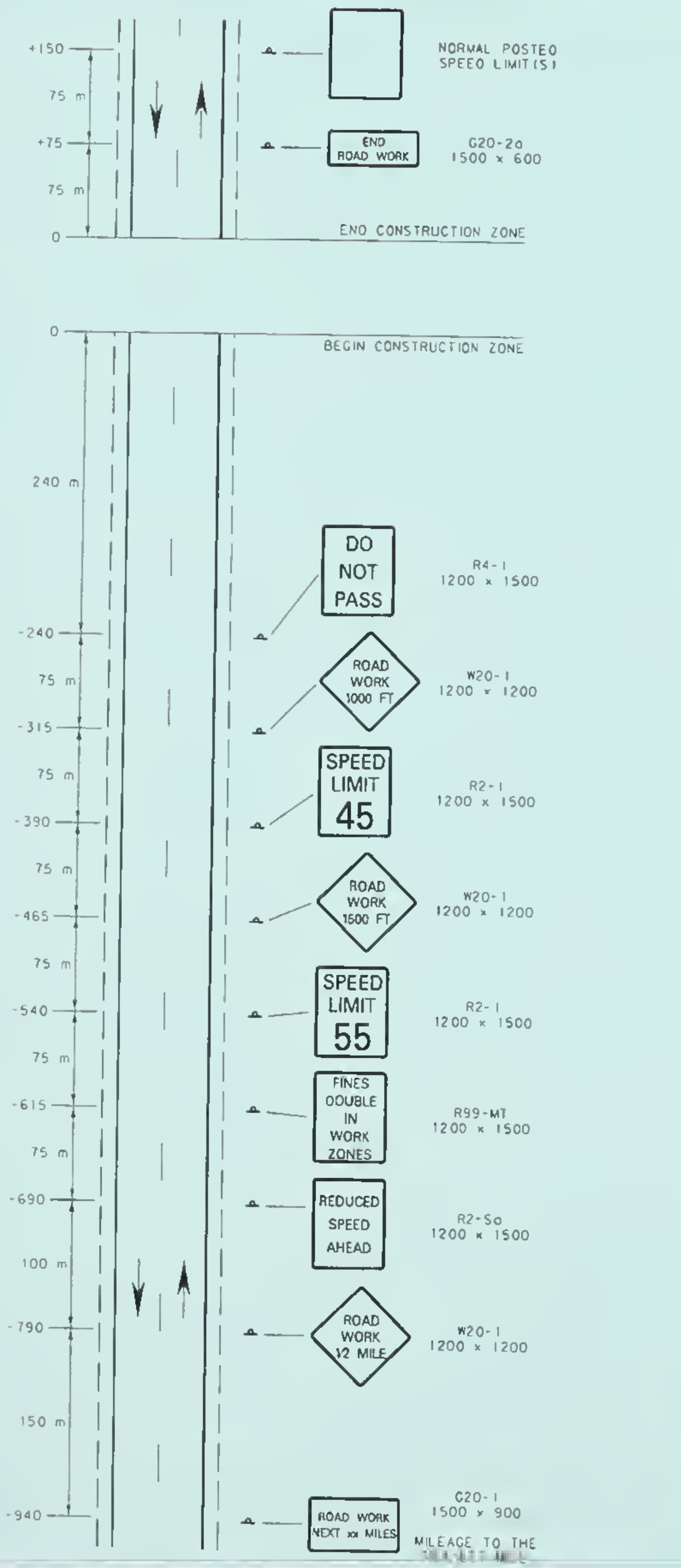
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 618
DWG. NO.
618-08

TWO-LANE
WORK ZONES
WITHIN PROJECT LIMITS

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



NOTES:

THIS SIGN LAYOUT WORKS IN CONJUNCTION WITH THE PERMANENT LAYOUT ILLUSTRATED ON DTL. DWG. NO. 618-04. COVER OR OMIT SIGNS WHEN NOT IN USE, INCLUDING SPEED LIMIT SIGNS NOT WARRANTED.

INCLUDE REGULATORY SIGNING ONLY IF THERE IS REASON TO RESTRICT SPEED WITHIN THE CONSTRUCTION ZONE. MODIFY REGULATORY SIGNS TO MATCH ADJACENT REGULATIONS.

OMIT THE G20-1 SIGN ON PROJECTS LESS THAN 3.2 KILOMETERS IN LENGTH.

SET UP THIS SIGN LAYOUT IN EACH TRAFFIC DIRECTION.

THE CONSTRUCTION ZONE REFERS TO THE GENERAL AREA THAT REQUIRES TEMPORARY WORK ZONE TRAFFIC CONTROL.

FOR SEAL COAT WORK ZONE ACTIVITIES, USE THE FLAGGER APPLICATIONS OF THE WORK ZONE LAYOUTS FROM DTL. DWG. NO. 618-06 (AT PROJECT LIMIT) AND 618-08 (WITHIN PROJECT LIMITS).

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

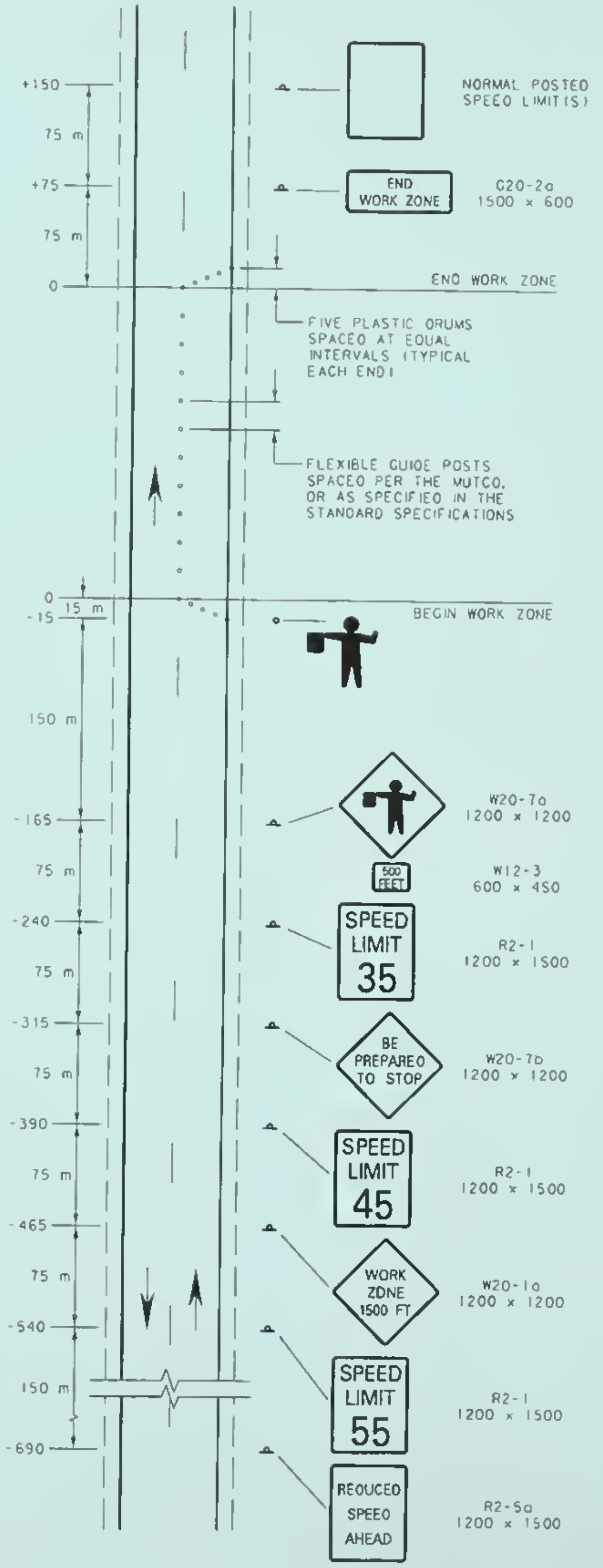
DETAILED DRAWING

REFERENCE STANDARD SPEC. SECTION 618	DWG. NO. 618-10

TWO-LANE
SEAL COAT PROJECT
CONSTRUCTION ZONE

EFFECTIVE: AUGUST 1999

MDT *MONTANA DEPARTMENT OF TRANSPORTATION* MONTANA CADD



NOTES:

MODIFY REGULATORY SIGNS TO MATCH ADJACENT REGULATIONS.

SET UP THIS SIGN LAYOUT IN EACH TRAFFIC DIRECTION.

THE WORK ZONE REFERS TO THE AREA WITHIN THE CONSTRUCTION ZONE WHERE WORK IS ACTUALLY TAKING PLACE.

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

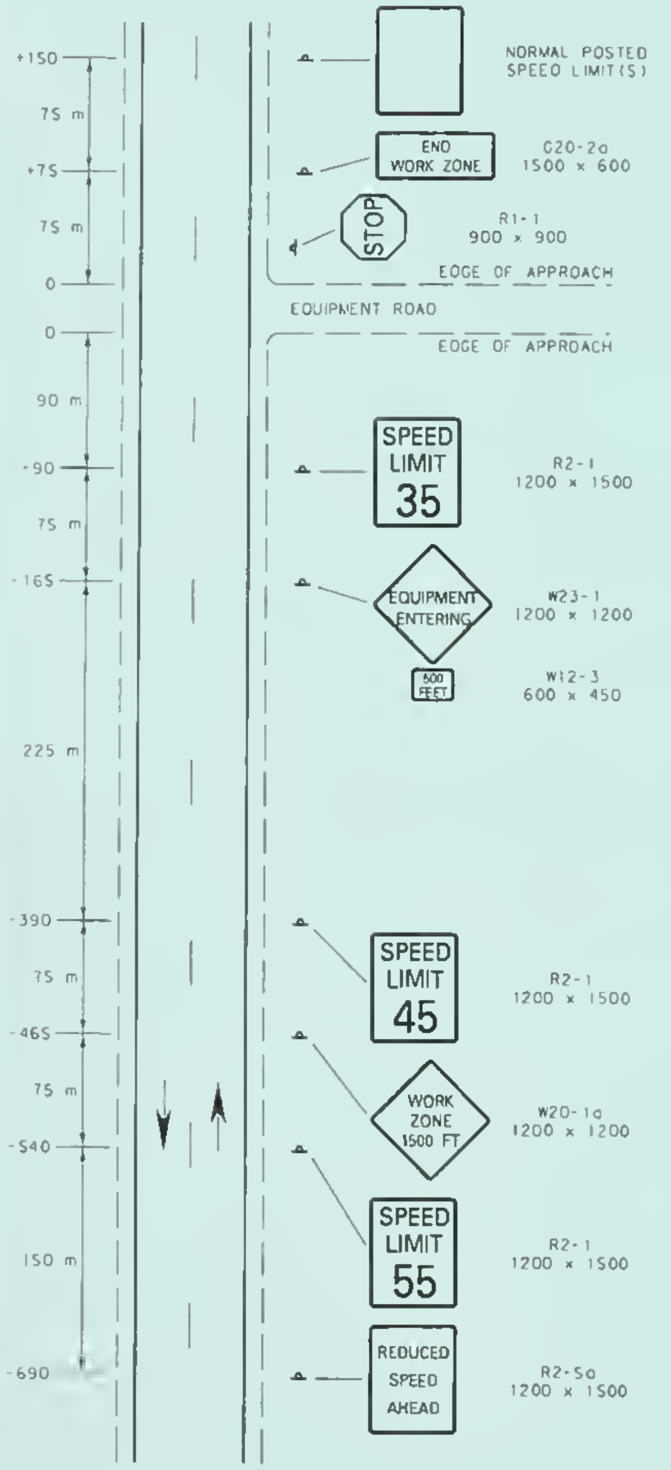
DETAILED DRAWING

REFERENCE STANDARD SPEC. SECTION 618	DWG. NO. 618-12

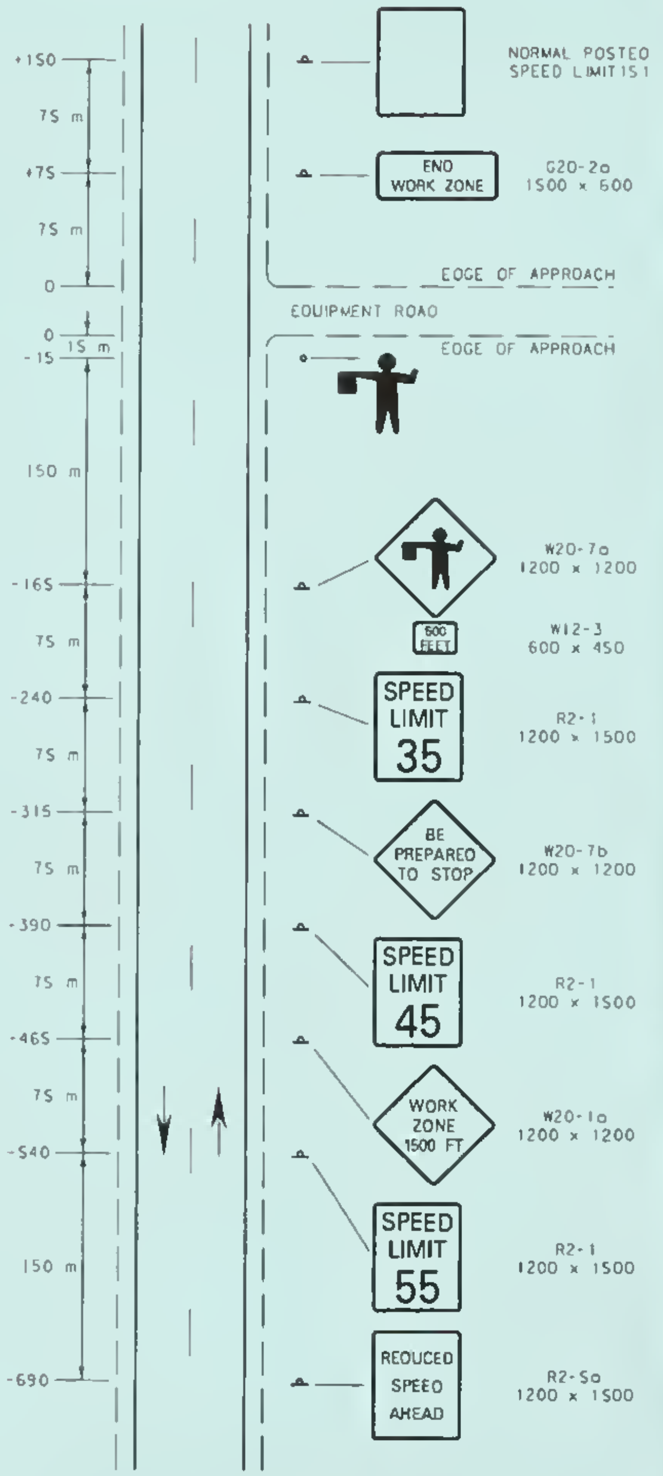
TWO-LANE
LANE CLOSURE

EFFECTIVE: AUGUST 1999

MDT *MONTANA DEPARTMENT OF TRANSPORTATION* MONTANA CADD



EQUIPMENT ENTRANCE WITH NO FLAGGER



EQUIPMENT ENTRANCE WITH FLAGGER

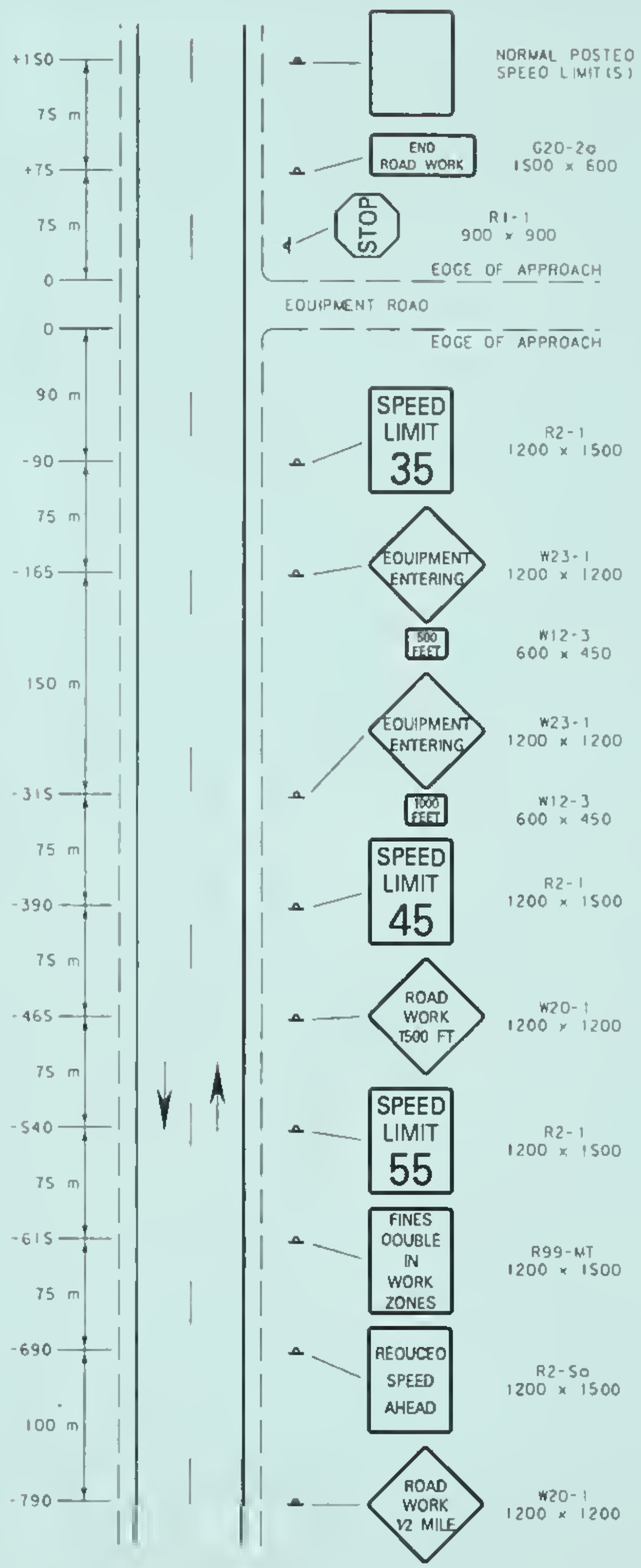
NOTES:

INCLUDE REGULATORY SIGNING ONLY IF THERE IS REASON TO RESTRICT SPEED. MODIFY REGULATORY SIGNS TO MATCH ADJACENT REGULATIONS.

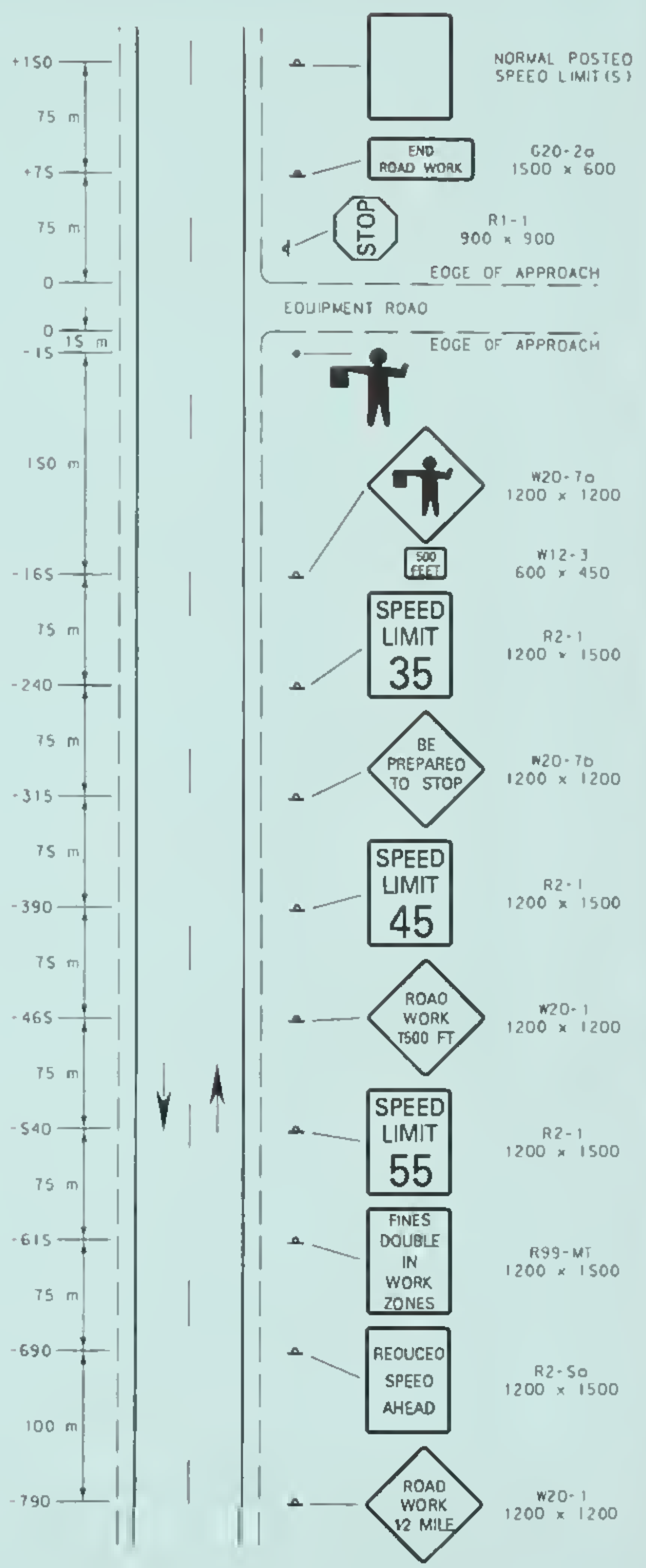
SET UP THIS SIGN LAYOUT IN EACH TRAFFIC DIRECTION, AS NEEDED.

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 618
DWG. NO.
618-14
TWO-LANE
EQUIPMENT ENTRANCES
WITHIN PROJECT LIMITS
EFFECTIVE: AUGUST 1999
MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



EQUIPMENT ENTRANCE WITH NO FLAGGER



EQUIPMENT ENTRANCE WITH FLAGGER

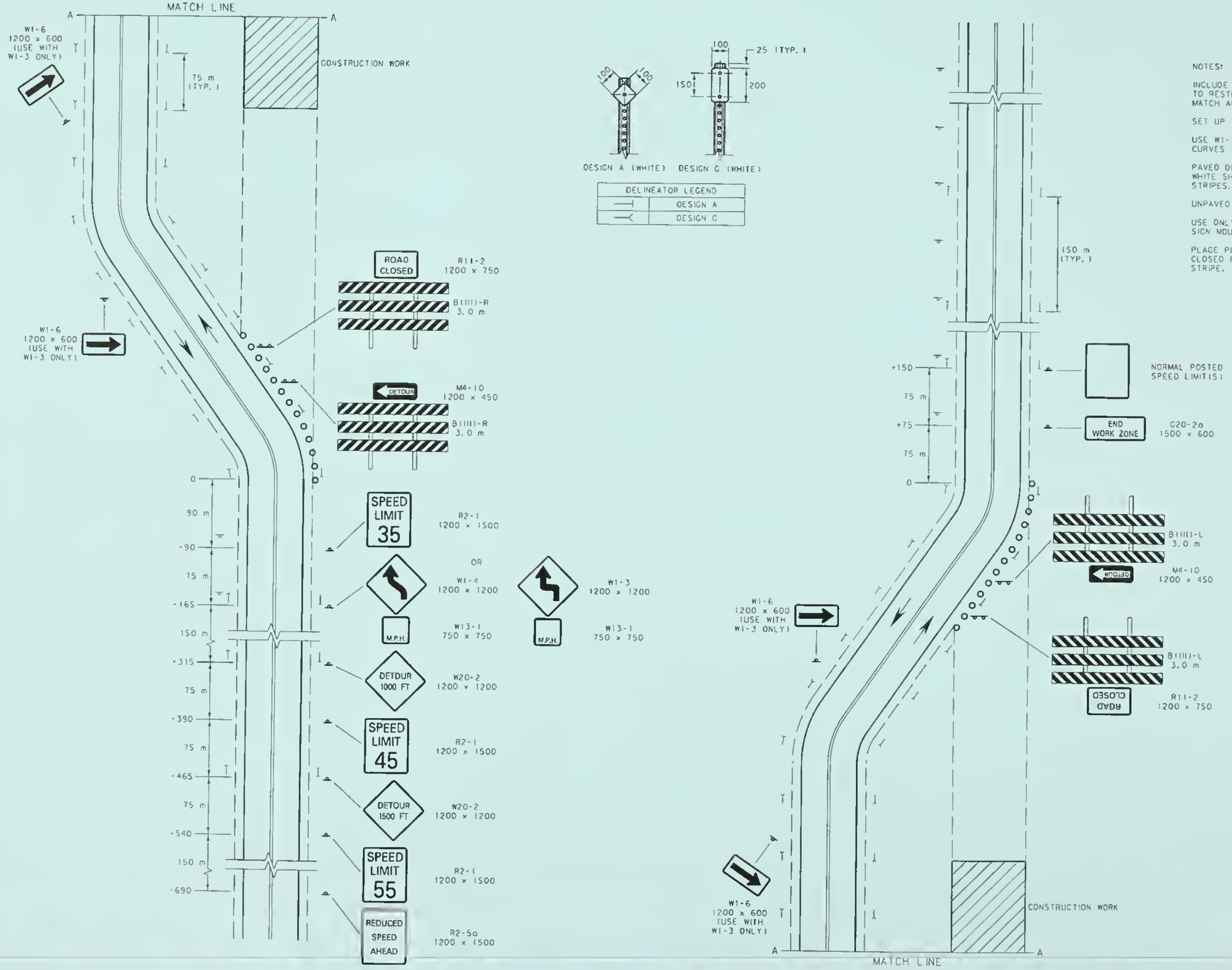
NOTES:

INCLUDE REGULATORY SIGNING ONLY IF THERE IS REASON TO RESTRICT SPEED. MODIFY REGULATORY SIGNS TO MATCH ADJACENT REGULATIONS.

SET UP THIS SIGN LAYOUT IN EACH TRAFFIC DIRECTION, AS NEEDED.

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 618
DWG. NO.
618-16
TWO-LANE
EQUIPMENT ENTRANCES
OUTSIDE PROJECT LIMITS
EFFECTIVE: AUGUST 1999
MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



NOTES:

INCLUDE REGULATORY SIGNING ONLY IF THERE IS REASON TO RESTRICT SPEED. MODIFY REGULATORY SIGNS TO MATCH ADJACENT REGULATIONS.

SET UP THIS SIGN LAYOUT IN EACH TRAFFIC DIRECTION.

USE W1-3 SIGNS ONLY WHEN THE DESIGN SPEED OF THE CURVES IS 50 km/h OR LESS.

PAVED DETOURS 7.2 m WIDE OR GREATER HAVE 100 mm WHITE SHOULDER STRIPES AND APPROPRIATE CENTERLINE STRIPES.

UNPAVED DETOURS MAY REQUIRE ADDITIONAL DELINEATION.

USE ONLY POST MOUNTED SIGNS. DO NOT USE PORTABLE SIGN MOUNTS.

PLACE PLASTIC DRUMS AT 1.5 m INTERVALS ON THE CLOSED ROADWAY, ADJACENT TO THE DETOUR SHOULDER STRIPE.

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 618
DWG. NO.
618-18

TWO-LANE
DETOUR

EFFECTIVE: AUGUST 1999
MONTANA DEPARTMENT
OF TRANSPORTATION
MONTANA
CADD

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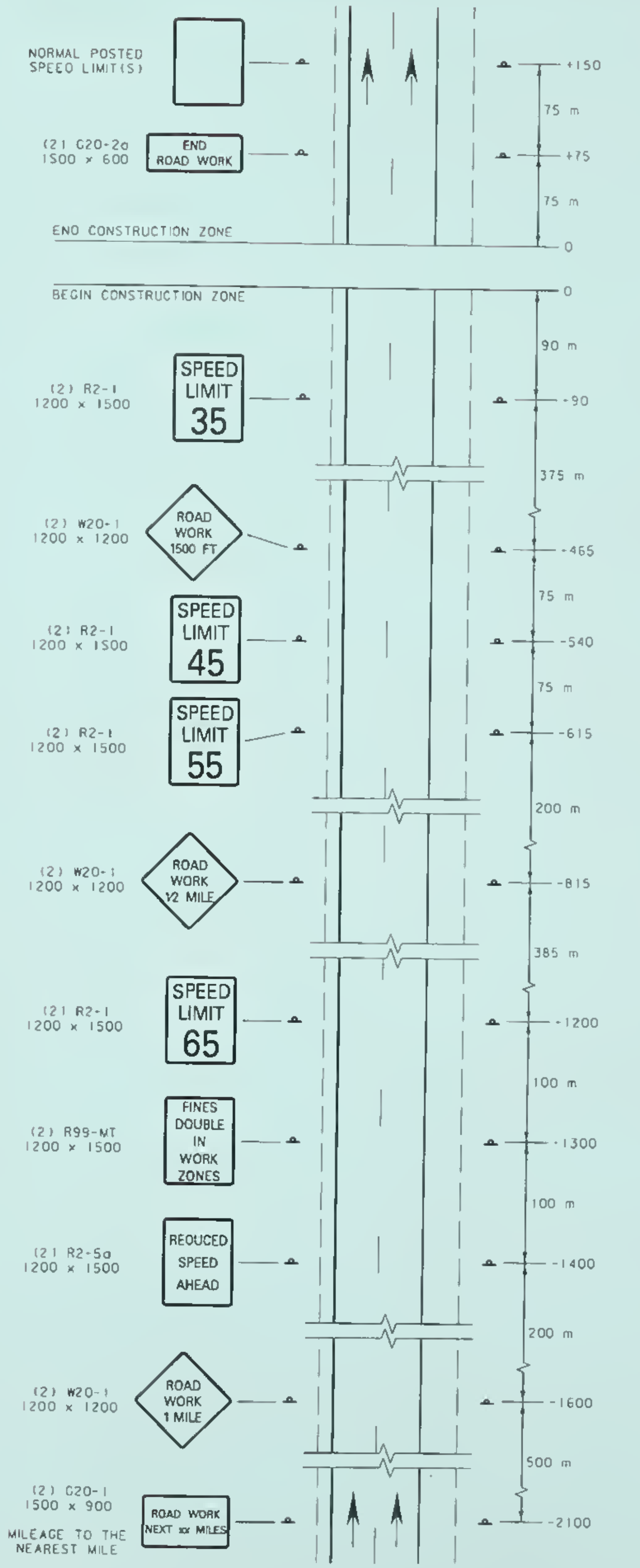


NOTES:

THIS SIGN LAYOUT IS INTENDED TO BE A PERMANENT INSTALLATION FOR THE DURATION OF THE PROJECT, AS APPROVED BY THE ENGINEER. OMIT OR COVER SIGNS WHEN NOT IN USE, INCLUDING SPEED LIMIT SIGNS NOT WARRANTED.

INCLUDE REGULATORY SIGNING ONLY IF THE CONSTRUCTION ZONE CONTAINS A WORK ZONE OR HAS ROADWAY CONDITIONS THAT WARRANT SPEED RESTRICTIONS. MODIFY REGULATORY SIGNS TO MATCH ADJACENT REGULATIONS.

OMIT THE G20-1 SIGN ON PROJECTS LESS THAN 3.2 KILOMETERS IN LENGTH.

SET UP THIS SIGN LAYOUT IN EACH TRAFFIC DIRECTION.

THE CONSTRUCTION ZONE REFERS TO THE GENERAL AREA THAT REQUIRES TEMPORARY WORK ZONE TRAFFIC CONTROL.

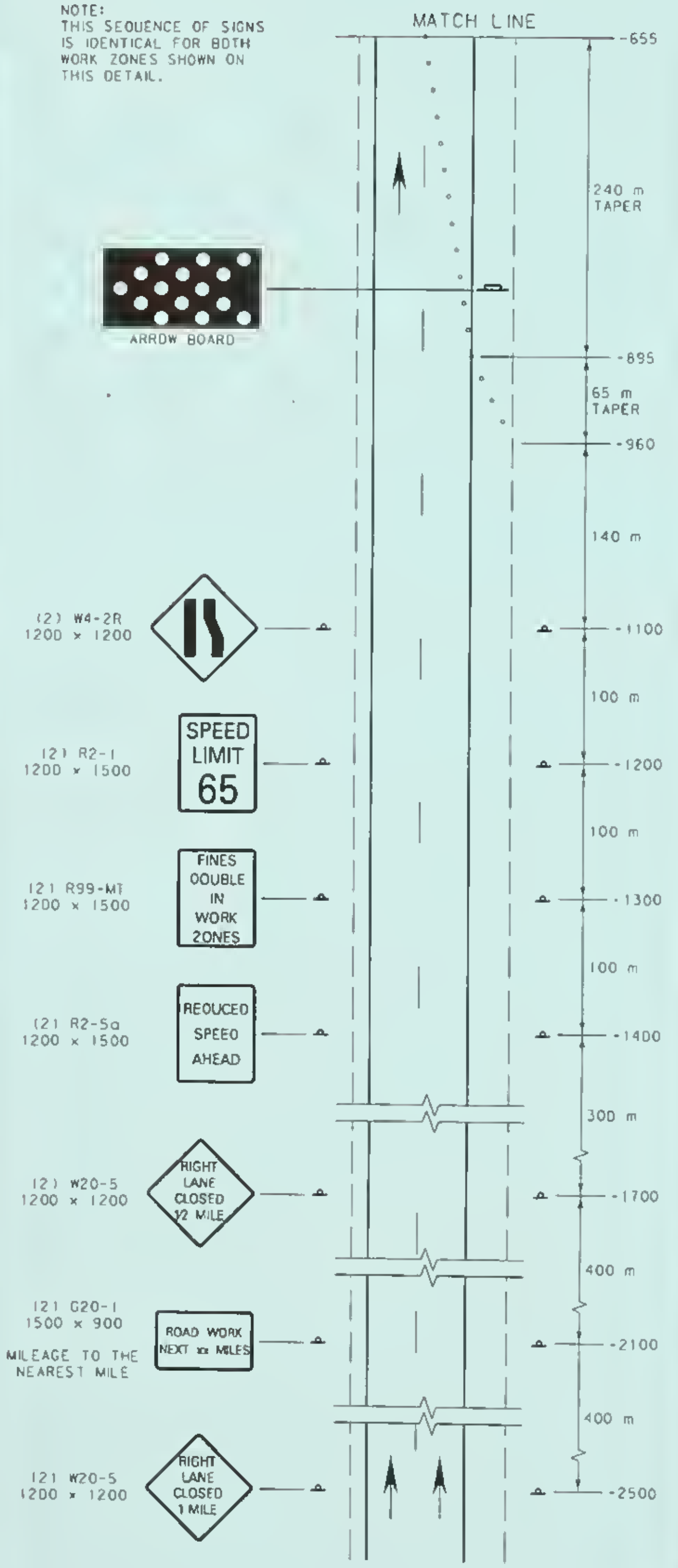
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

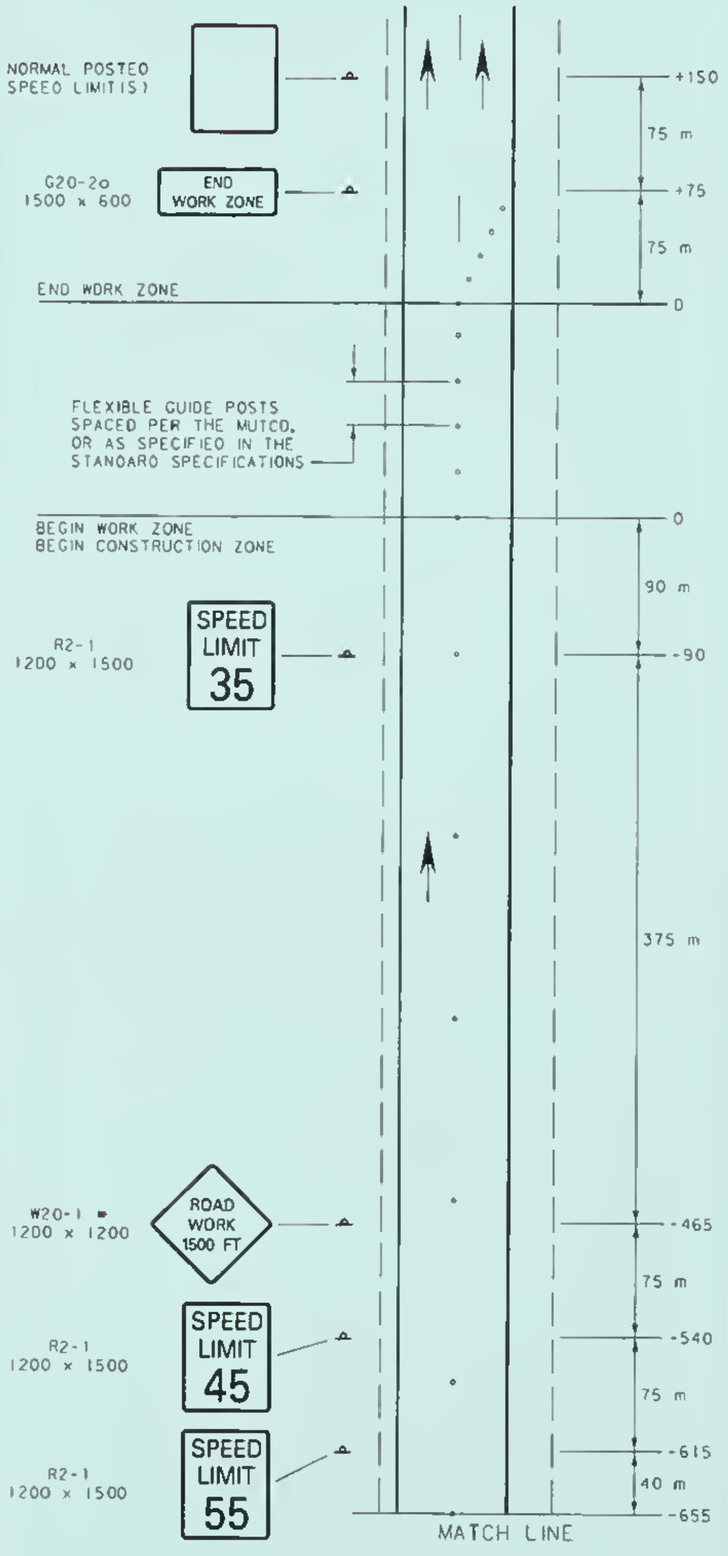
DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 618
DWG. NO.
618-20

FOUR-LANE
PROJECT
CONSTRUCTION ZONE

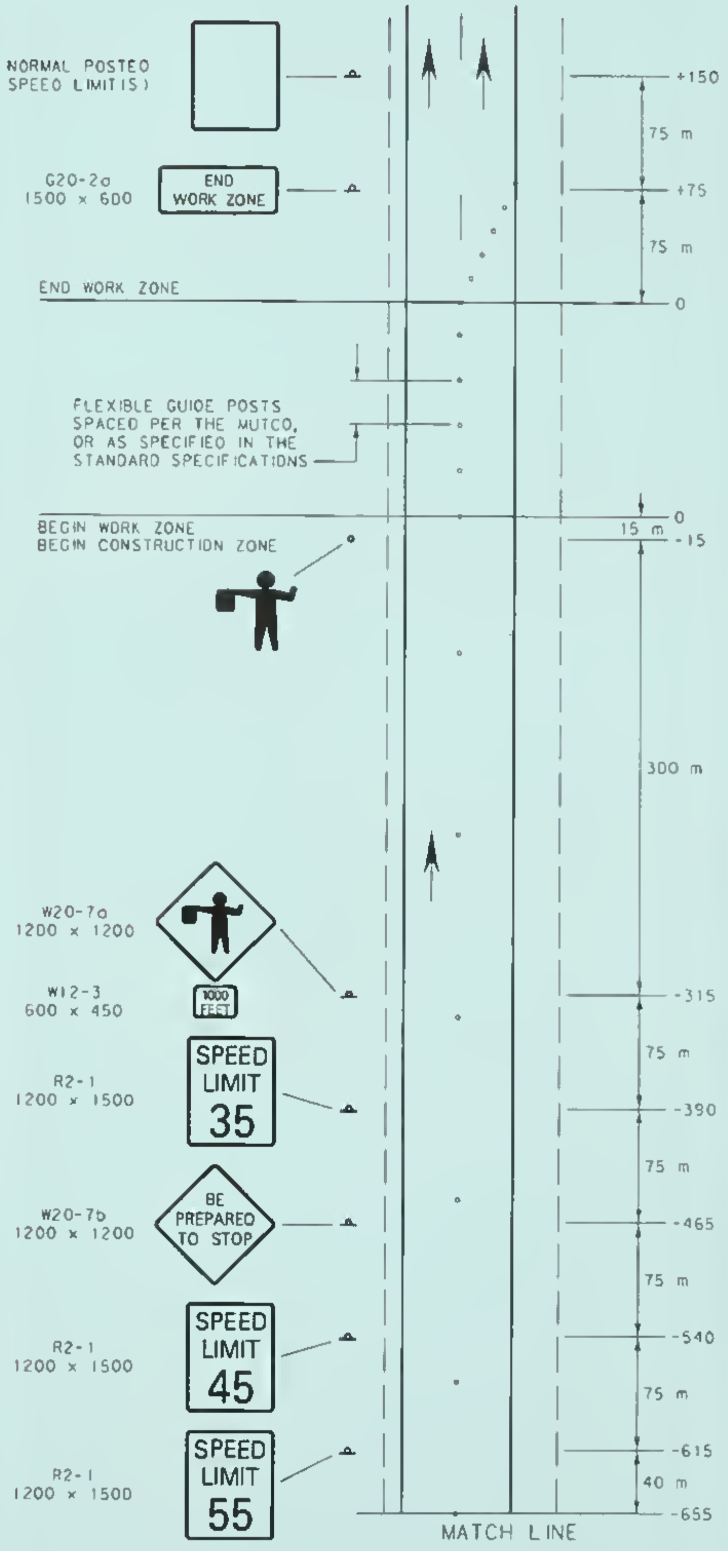
EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD





WORK ZONE WITH NO FLAGGER



WORK ZONE WITH FLAGGER

NOTES:

THESE SIGN LAYOUTS WORK IN CONJUNCTION WITH THE PERMANENT LAYOUT ILLUSTRATED ON DTL. DWG. NO. 618-20. COVER OR OMIT SIGNS WHEN NOT IN USE, INCLUDING SPEED LIMIT SIGNS NOT WARRANTED.

INCLUDE REGULATORY SIGNING ONLY IF THERE IS REASON TO RESTRICT SPEED WITHIN THE WORK ZONE. MODIFY REGULATORY SIGNS TO MATCH ADJACENT REGULATIONS.

THE WORK ZONE REFERS TO THE AREA WITHIN THE CONSTRUCTION ZONE WHERE WORK IS ACTUALLY TAKING PLACE.

* USE MORE SPECIFIC SIGNS, WHERE APPLICABLE, SUCH AS W8-3 "PAVEMENT ENDS."

USE PLASTIC DRUMS FOR CHANNELIZATION IN ALL TRANSITION SECTIONS.

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

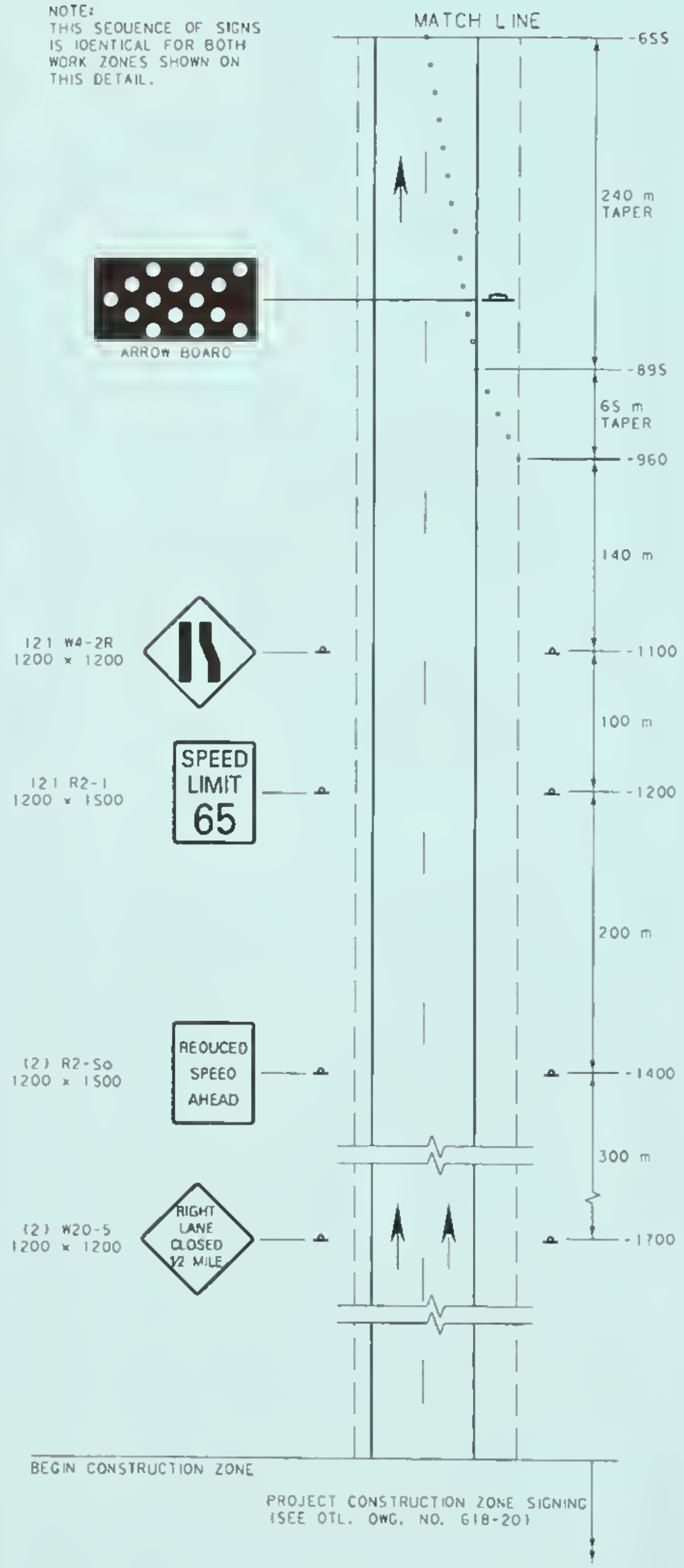
DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 618
DWG. NO.
618-22

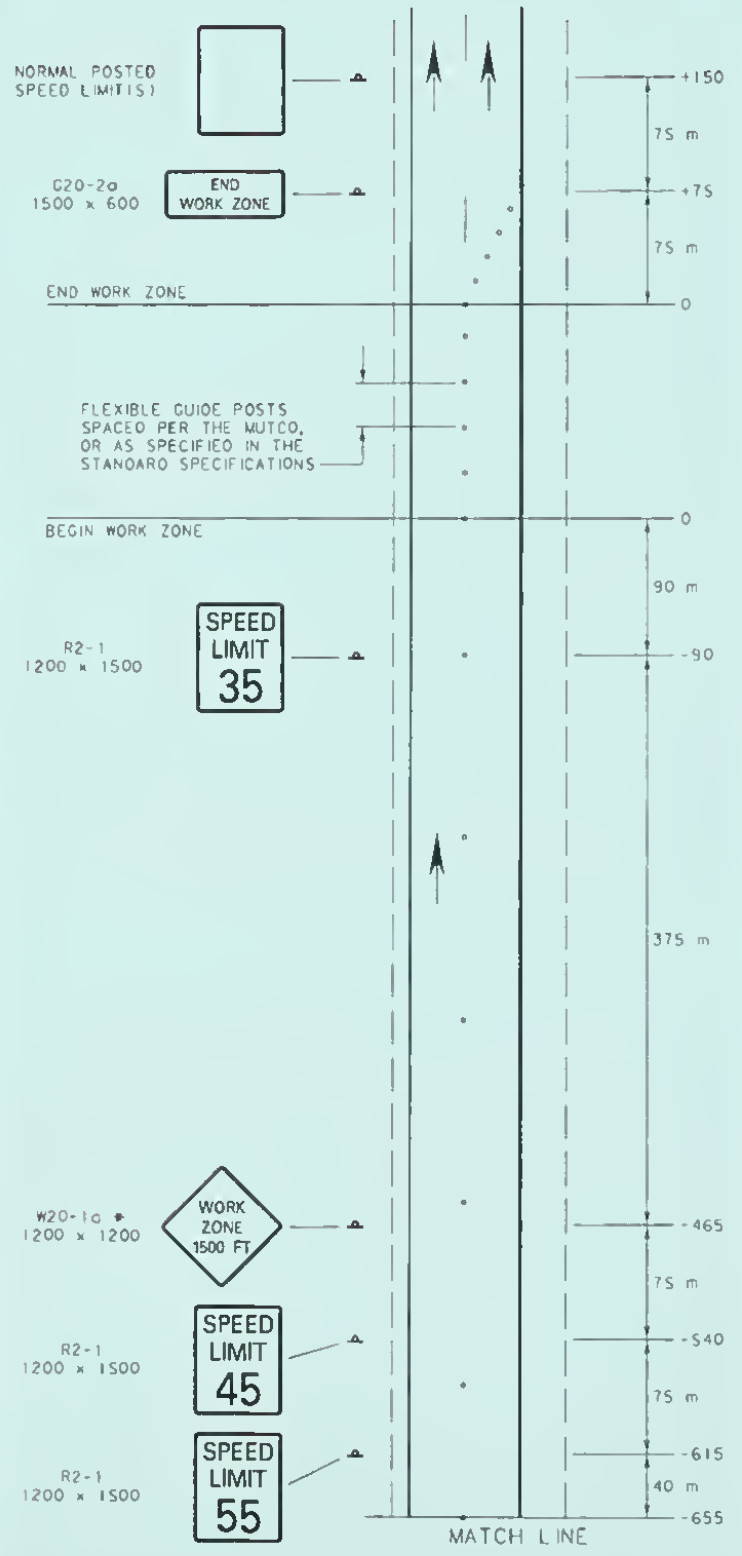
FOUR-LANE
WORK ZONES
AT PROJECT LIMIT

EFFECTIVE: AUGUST 1999

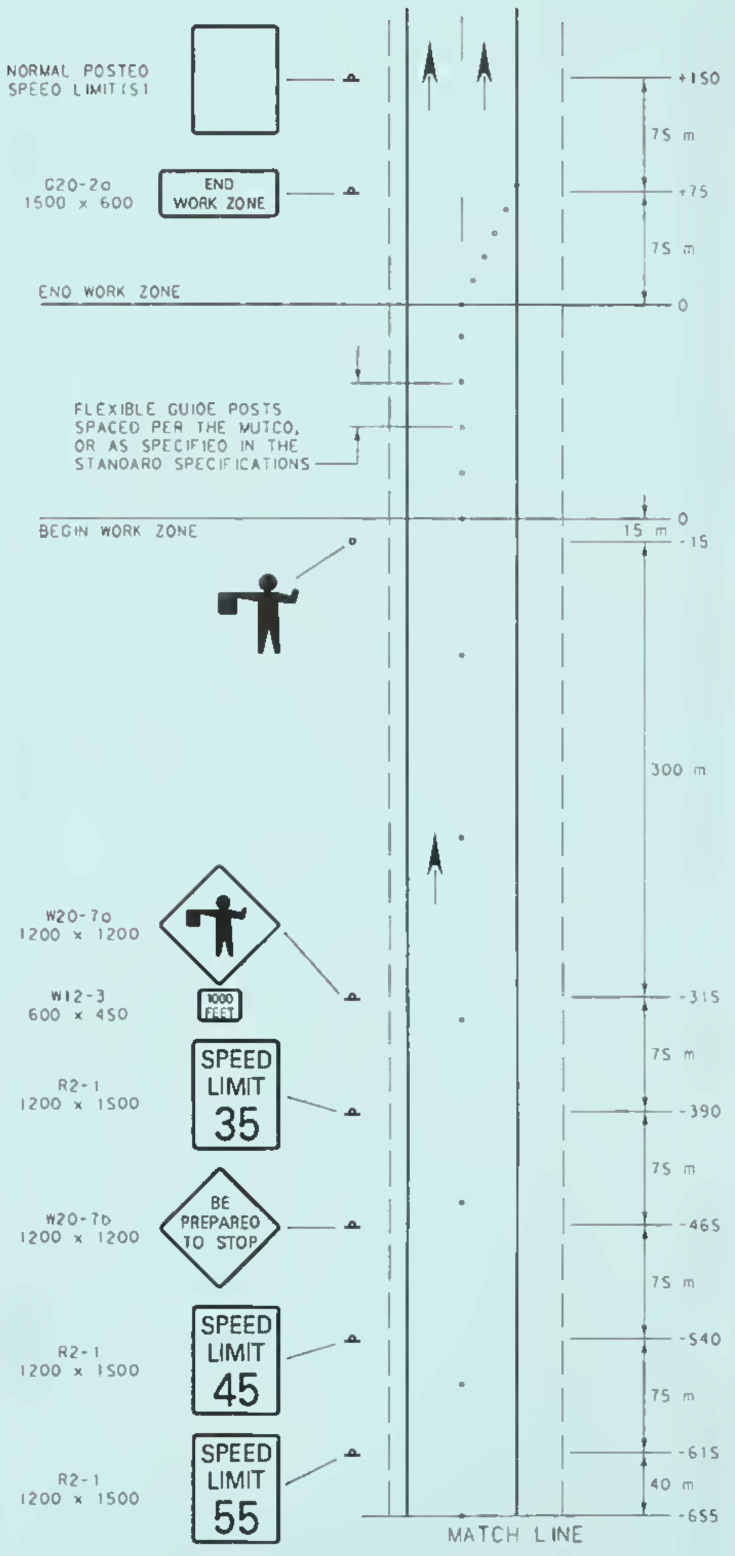
MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

NOTE:
THIS SEQUENCE OF SIGNS IS IDENTICAL FOR BOTH WORK ZONES SHOWN ON THIS DETAIL.





WORK ZONE WITH NO FLAGGER



WORK ZONE WITH FLAGGER

NOTES:

INCLUDE REGULATORY SIGNING ONLY IF THERE IS REASON TO RESTRICT SPEED WITHIN THE WORK ZONE. MODIFY REGULATORY SIGNS TO MATCH ADJACENT REGULATIONS.

THE WORK ZONE REFERS TO THE AREA WITHIN THE CONSTRUCTION ZONE WHERE WORK IS ACTUALLY TAKING PLACE.

• USE MORE SPECIFIC SIGNS, WHERE APPLICABLE, SUCH AS W8-3 "PAVEMENT ENDS."

USE PLASTIC DRUMS FOR CHANNELIZATION IN ALL TRANSITION SECTIONS.

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

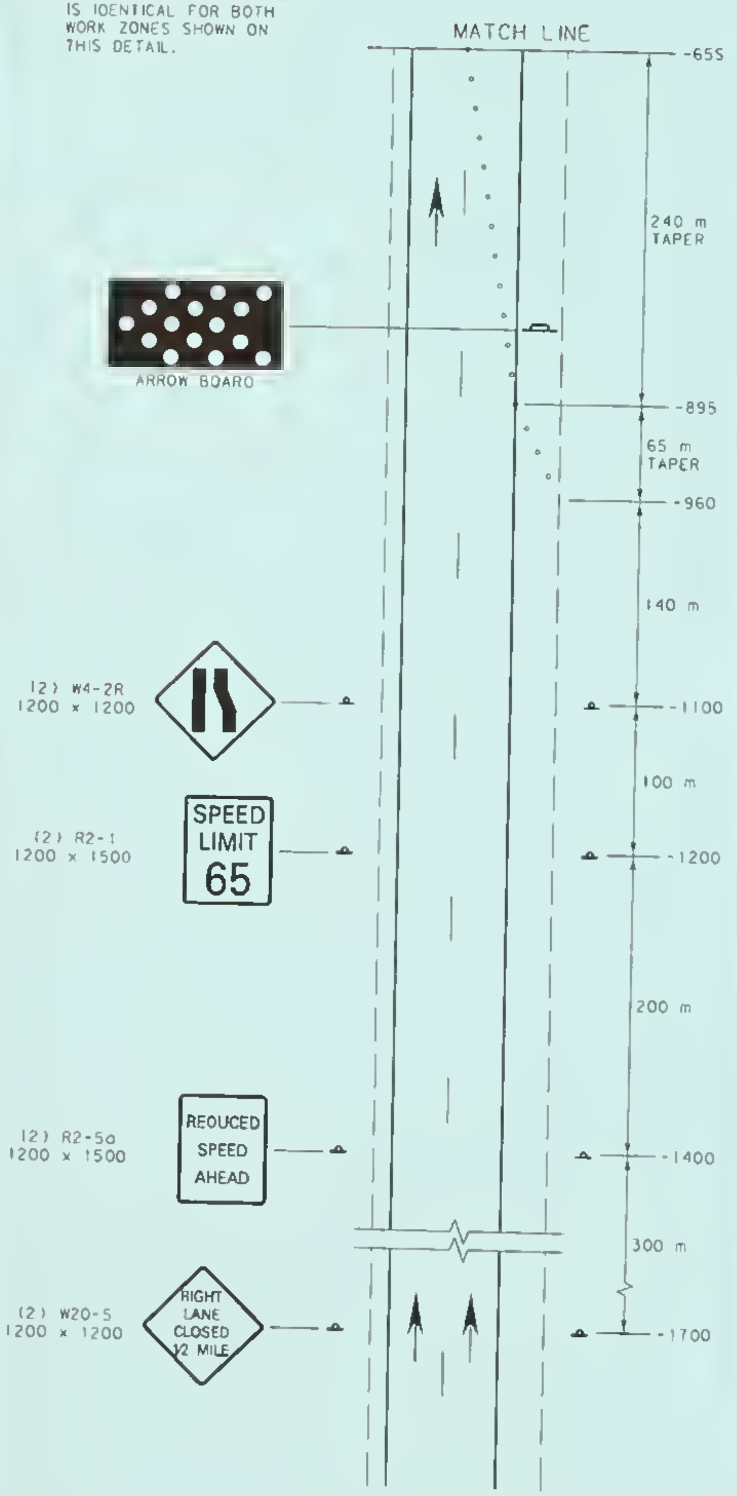
DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 618
DWG. NO.
618-24

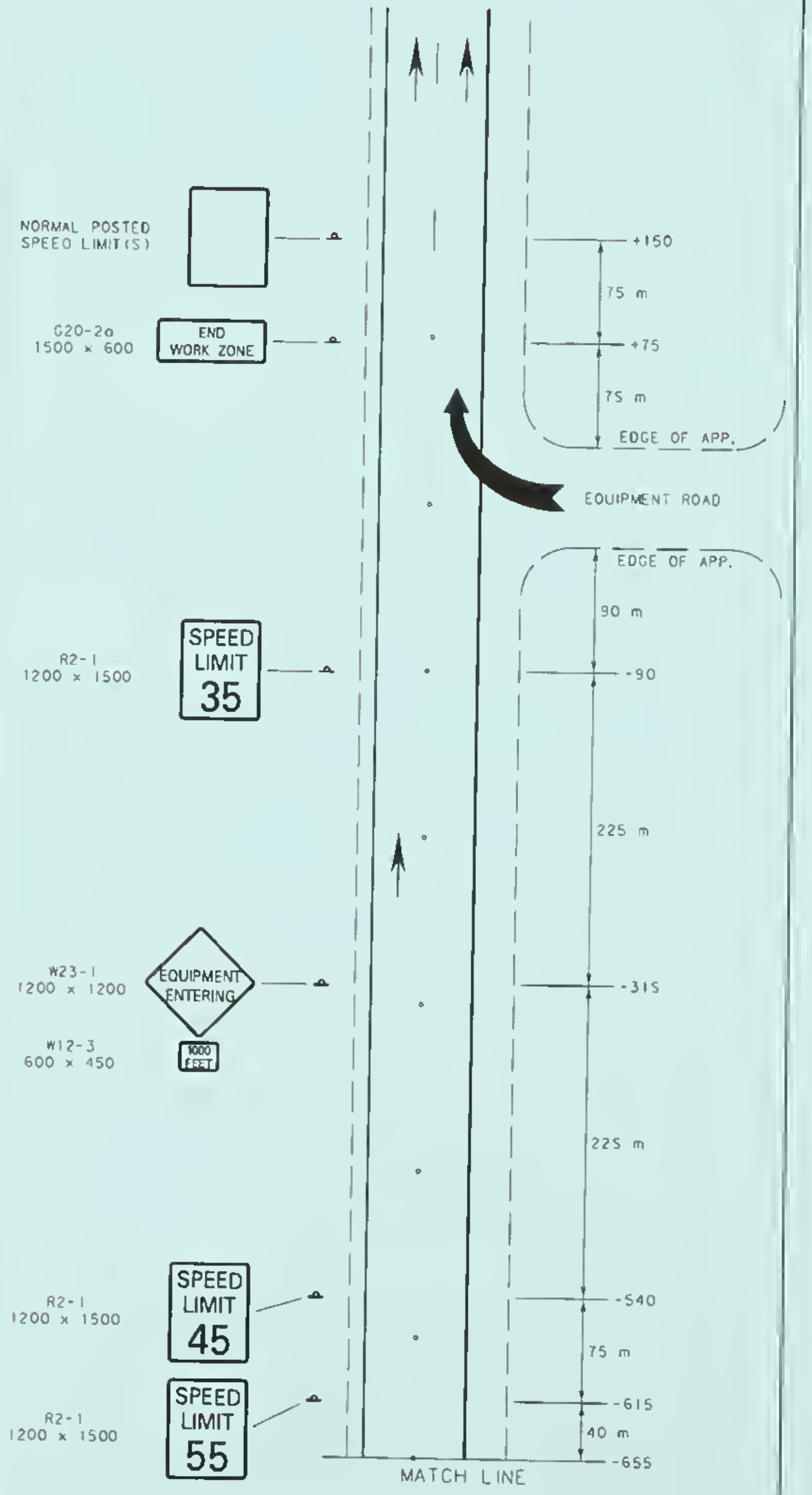
FOUR-LANE
WORK ZONES
WITHIN PROJECT LIMITS

EFFECTIVE: AUGUST 1999

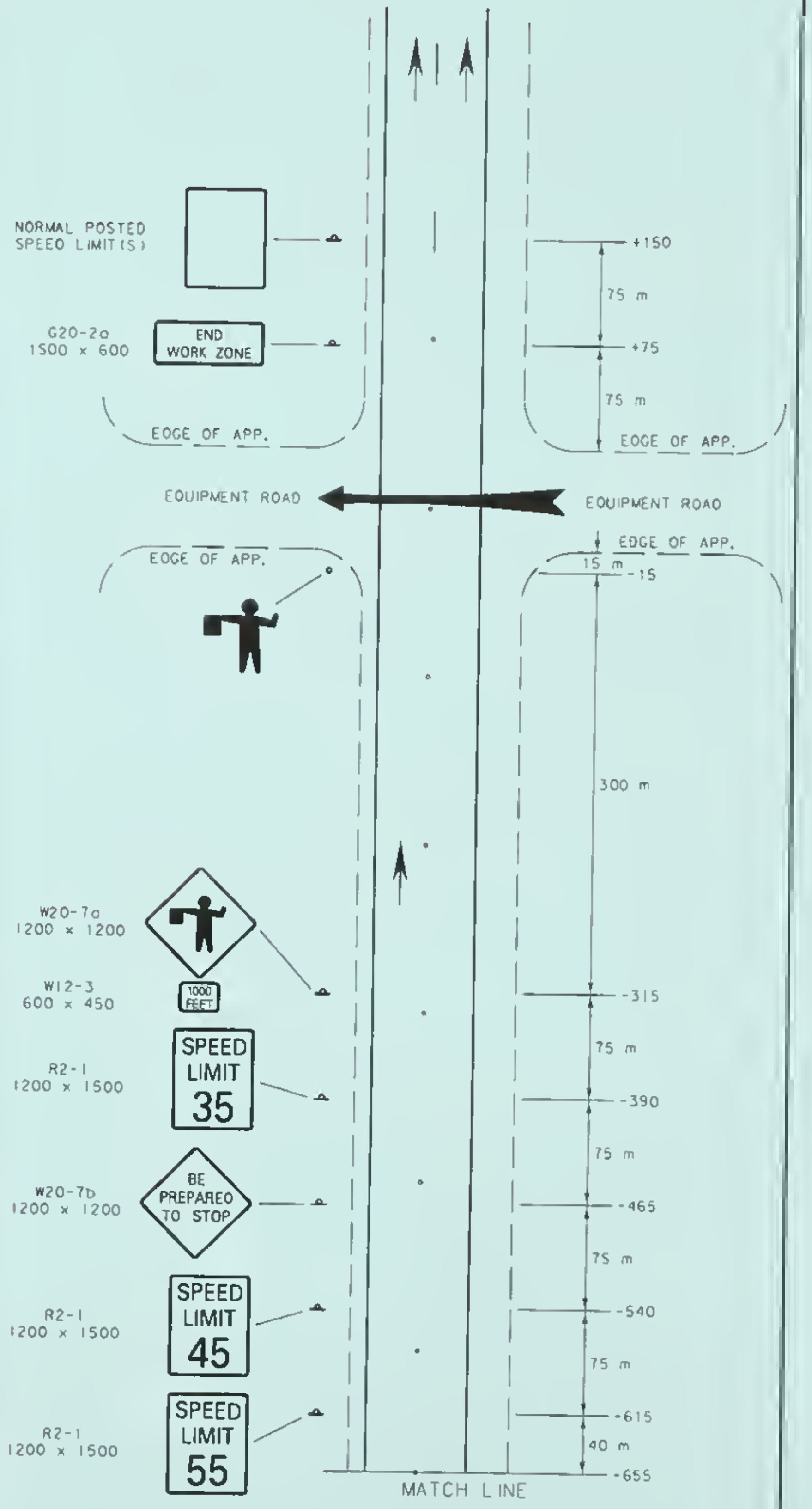
MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

NOTE:
THIS SEQUENCE OF SIGNS IS IDENTICAL FOR BOTH WORK ZONES SHOWN ON THIS DETAIL.





WORK ZONE WITH NO FLAGGER



WORK ZONE WITH FLAGGER

NOTES:

INCLUDE REGULATORY SIGNING ONLY IF THERE IS REASON TO RESTRICT SPEED WITHIN THE WORK ZONE. MODIFY REGULATORY SIGNS TO MATCH ADJACENT REGULATIONS.

USE PLASTIC DRUMS FOR CHANNELIZATION IN ALL TRANSITION SECTIONS.

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

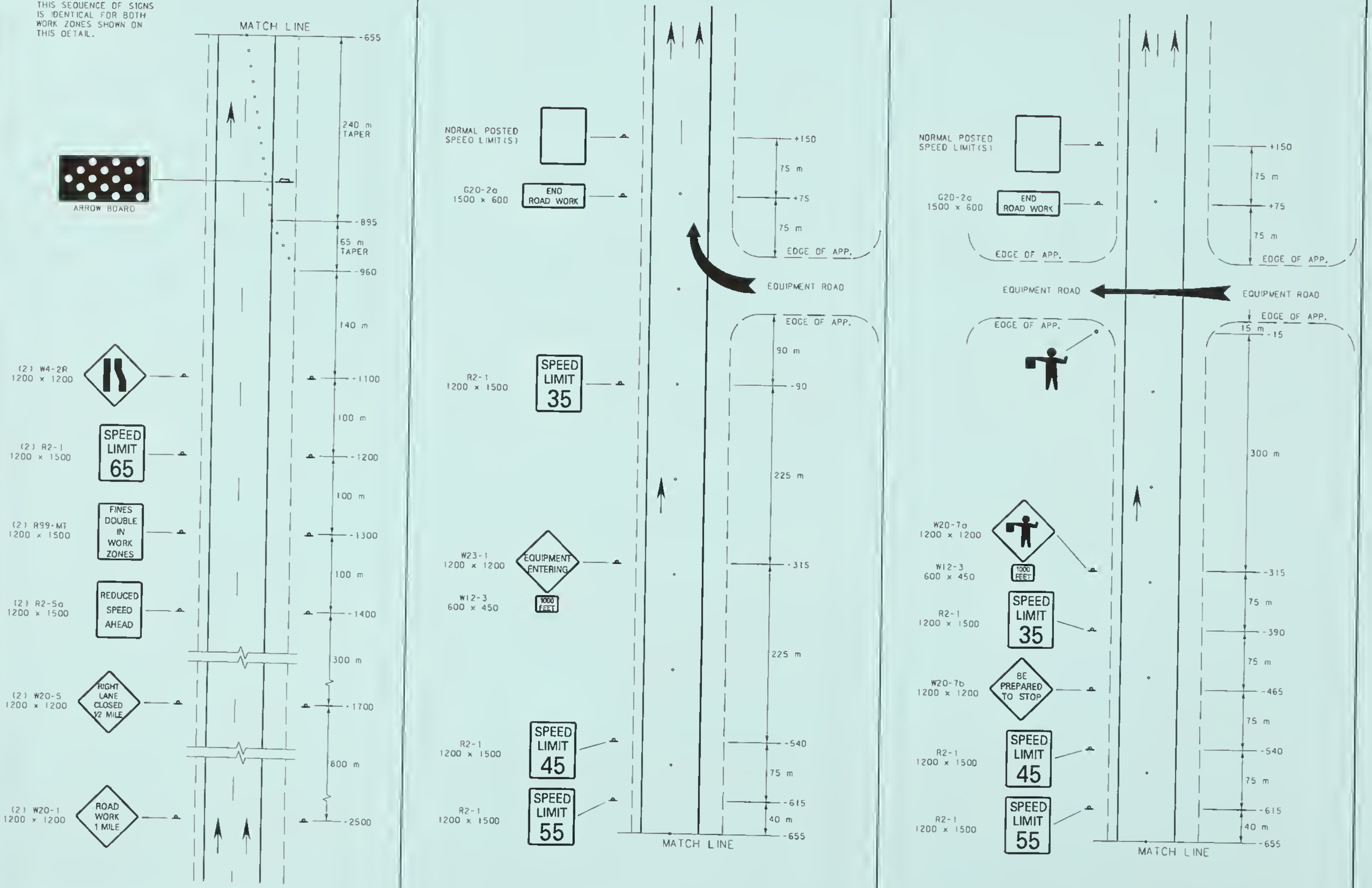
DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 618
DWG. NO.
618-26

FOUR-LANE
EQUIPMENT ENTRANCES
WITHIN PROJECT LIMITS

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

NOTE:
THIS SEQUENCE OF SIGNS IS IDENTICAL FOR BOTH WORK ZONES SHOWN ON THIS DETAIL.



WORK ZONE WITH NO FLAGGER

WORK ZONE WITH FLAGGER

NOTES:

INCLUDE REGULATORY SIGNING ONLY IF THERE IS REASON TO RESTRICT SPEED WITHIN THE WORK ZONE. MODIFY REGULATORY SIGNS TO MATCH ADJACENT REGULATIONS.

USE PLASTIC DRUMS FOR CHANNELIZATION IN ALL TRANSITION SECTIONS.

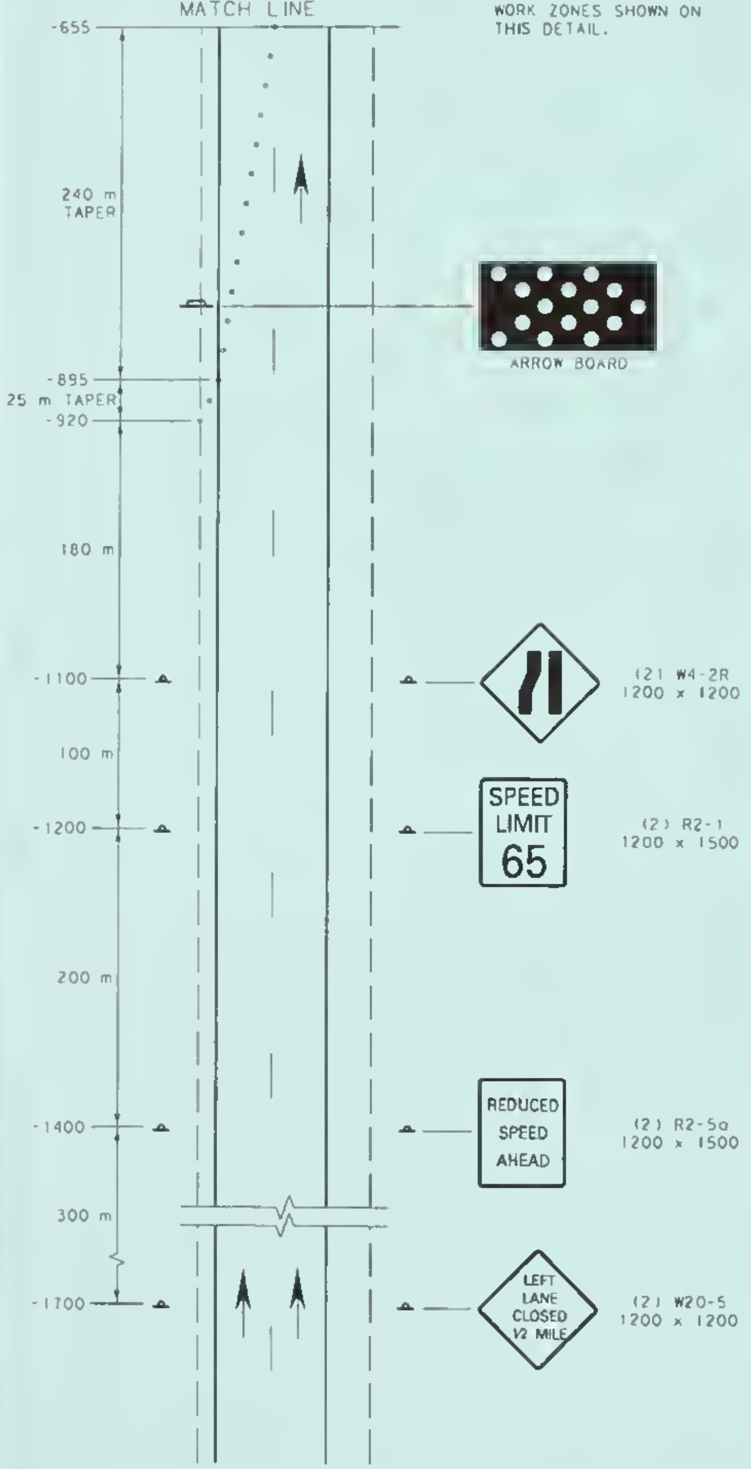
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 618
DWG. NO.
618-27

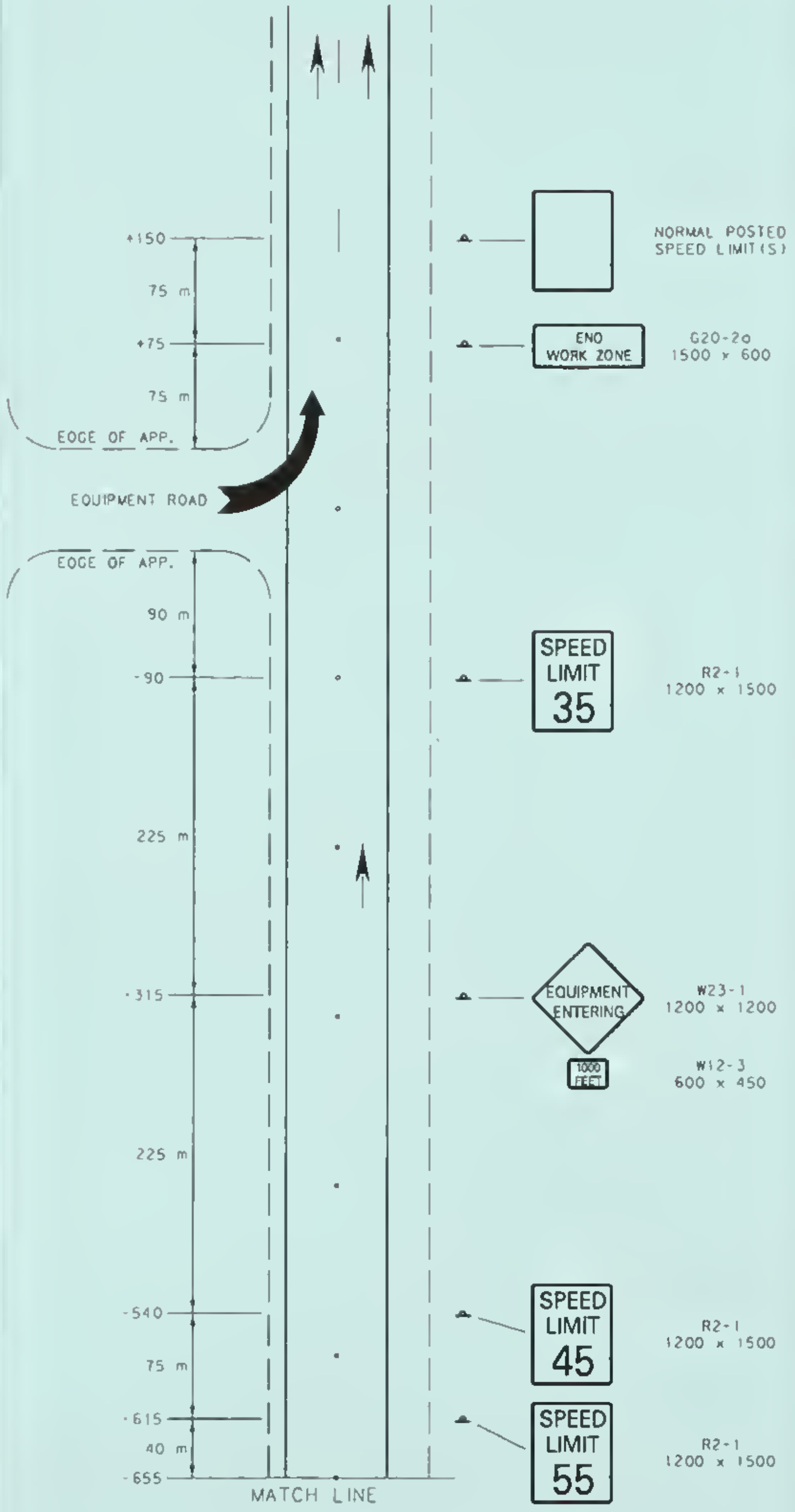
FOUR-LANE
EQUIPMENT ENTRANCES
OUTSIDE PROJECT LIMITS

EFFECTIVE: AUGUST 1999

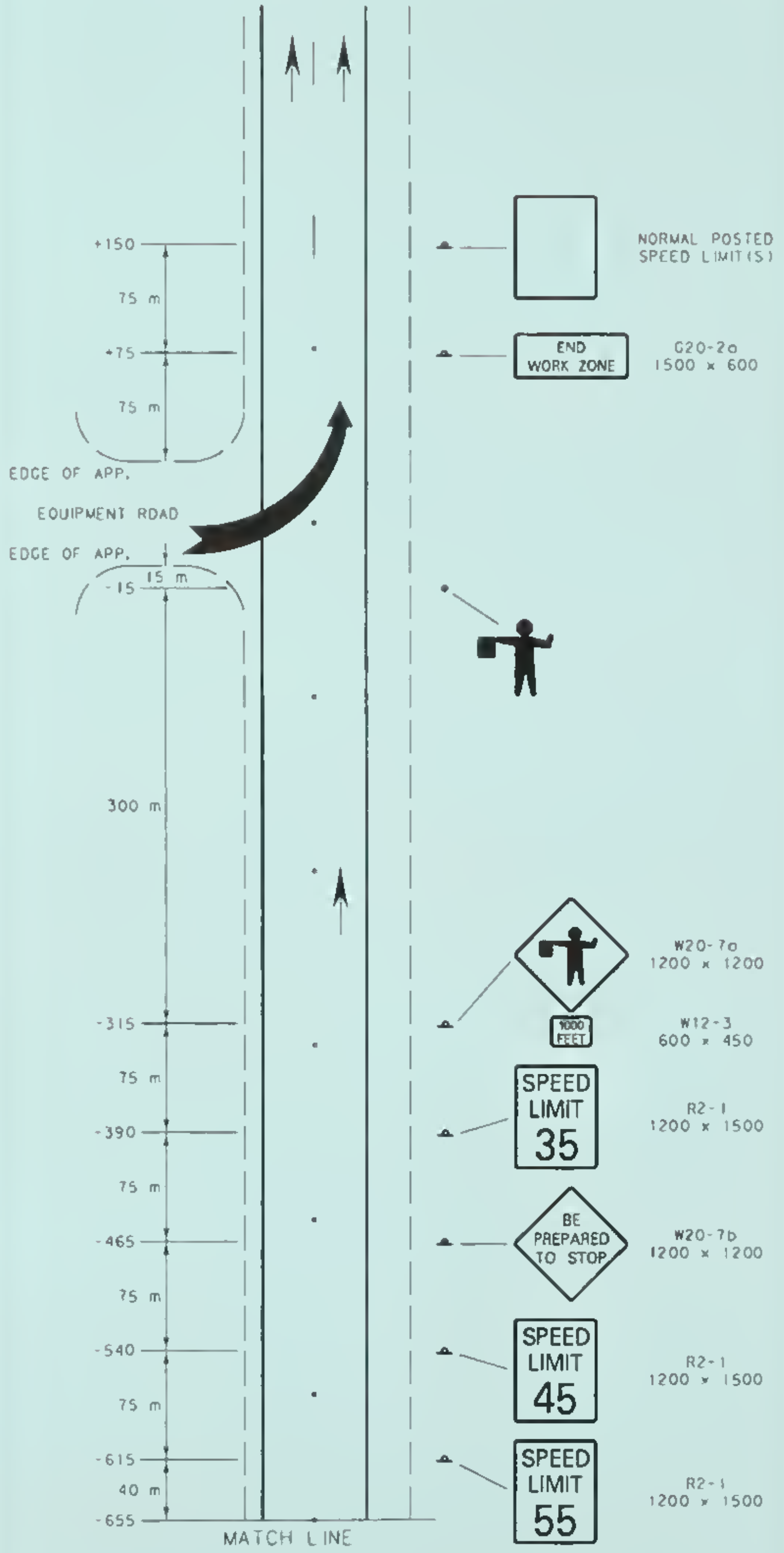
MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



NOTE:
THIS SEQUENCE OF SIGNS IS IDENTICAL FOR BOTH WORK ZONES SHOWN ON THIS DETAIL.



WORK ZONE WITH NO FLAGGER
(USE WITH WIDE MEDIANS)



WORK ZONE WITH FLAGGER
(USE WITH NARROW MEDIANS)

NOTES:

INCLUDE REGULATORY SIGNING ONLY IF THERE IS REASON TO RESTRICT SPEED WITHIN THE WORK ZONE. MODIFY REGULATORY SIGNS TO MATCH ADJACENT REGULATIONS.

USE PLASTIC DRUMS FOR CHANNELIZATION IN ALL TRANSITION SECTIONS.

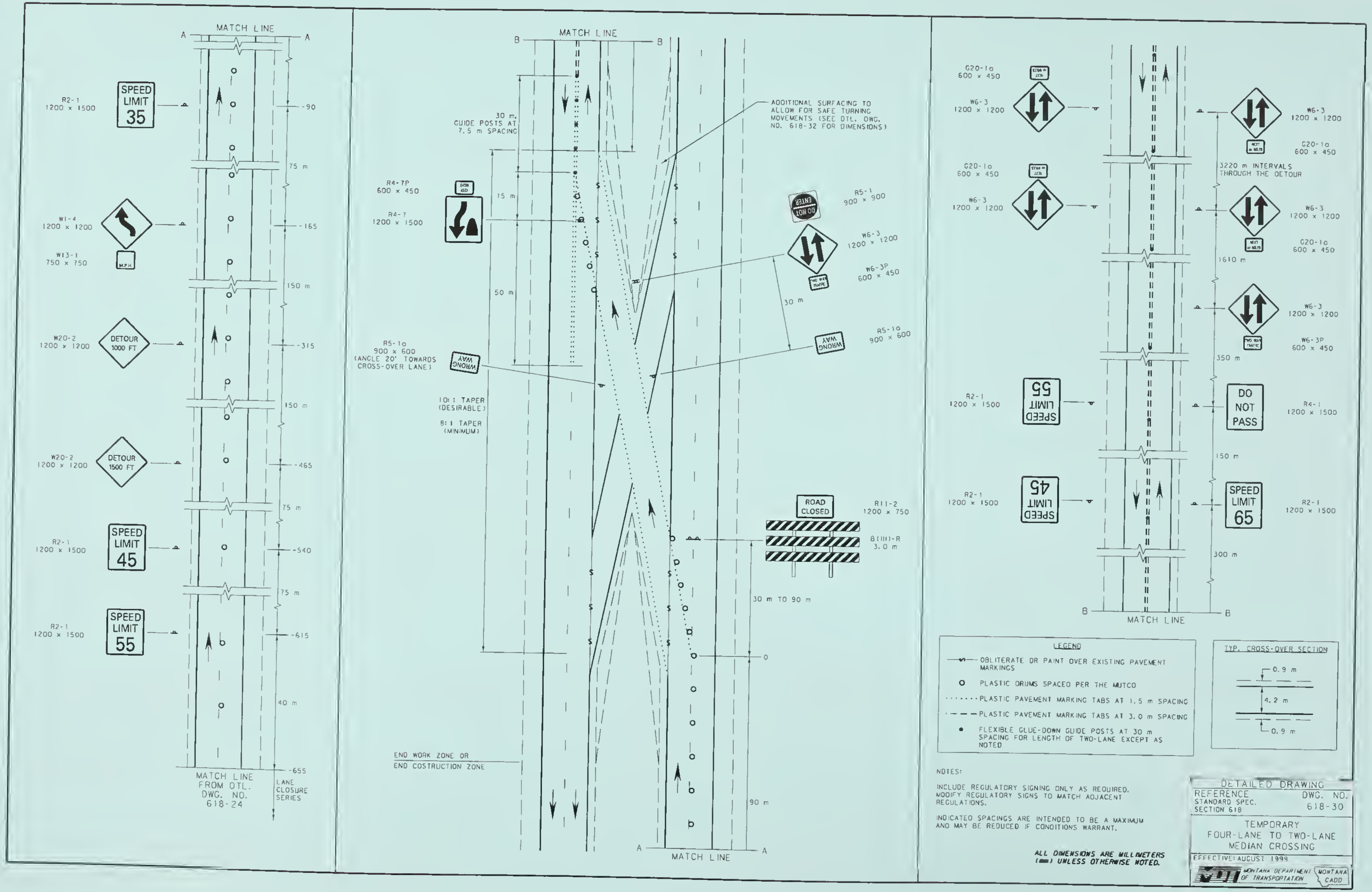
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 618	DWG. NO. 618-28

FOUR-LANE
MEDIAN CROSSINGS

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



LEGEND

- OBLITERATE OR PAINT OVER EXISTING PAVEMENT MARKINGS
- ○ PLASTIC DRUMS SPACED PER THE MUTCD
- ······ PLASTIC PAVEMENT MARKING TABS AT 1.5 m SPACING
- — — — PLASTIC PAVEMENT MARKING TABS AT 3.0 m SPACING
- ● FLEXIBLE GLUE-DOWN GUIDE POSTS AT 30 m SPACING FOR LENGTH OF TWO-LANE EXCEPT AS NOTED

NOTES:

INCLUDE REGULATORY SIGNING ONLY AS REQUIRED. MODIFY REGULATORY SIGNS TO MATCH ADJACENT REGULATIONS.

INDICATED SPACINGS ARE INTENDED TO BE A MAXIMUM AND MAY BE REDUCED IF CONDITIONS WARRANT.

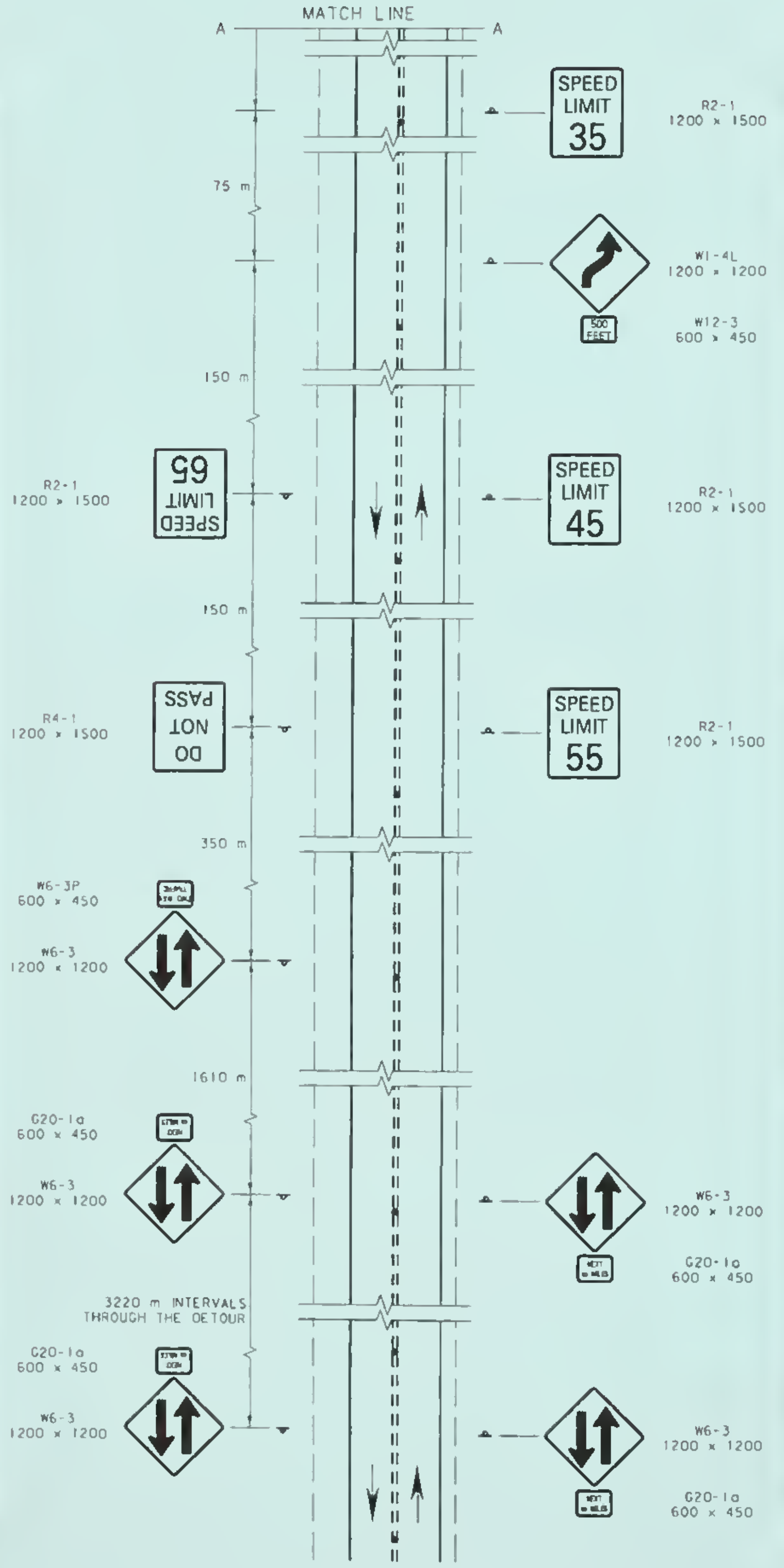
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

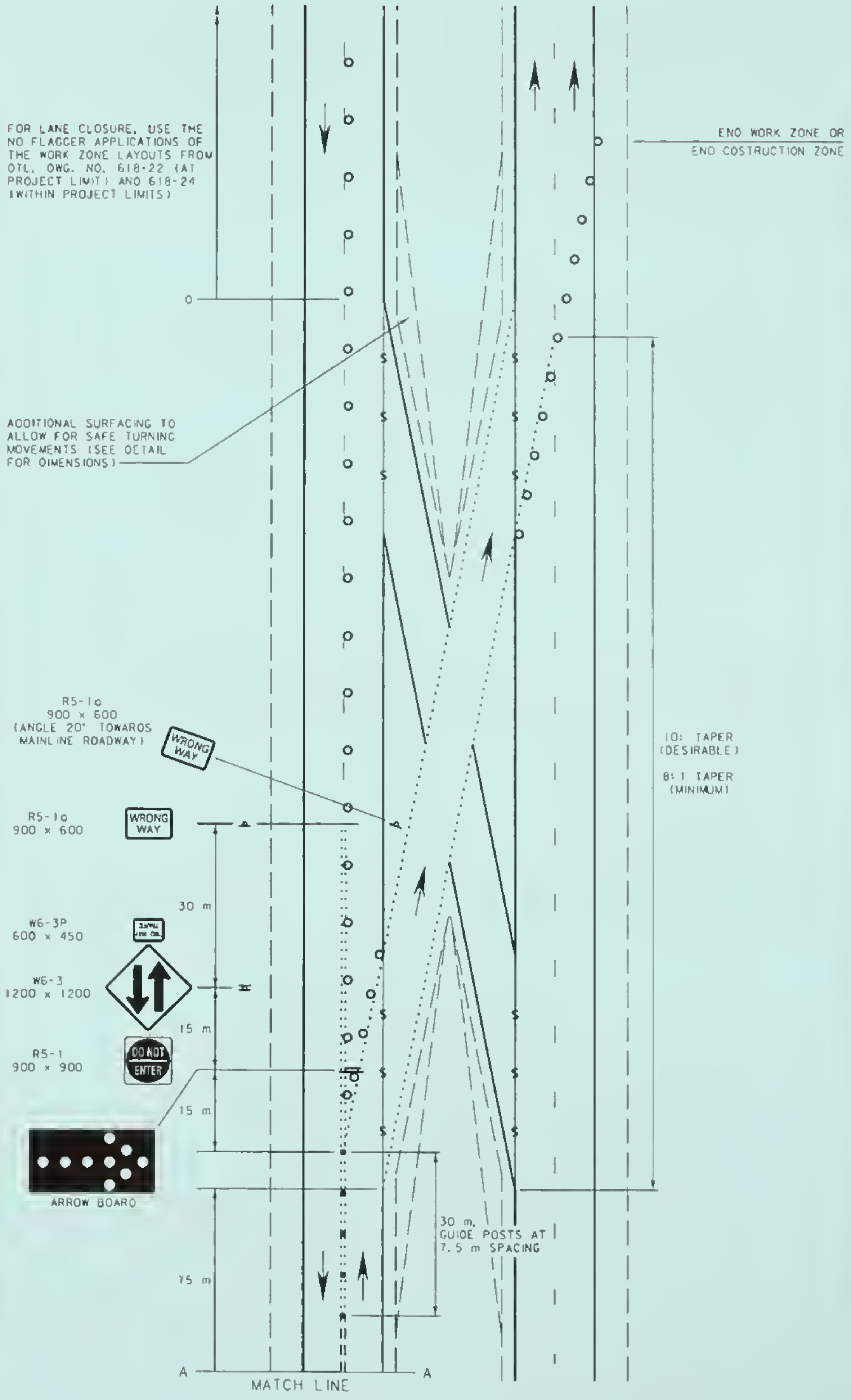
DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 618
DWG. NO.
618-30

TEMPORARY
FOUR-LANE TO TWO-LANE
MEDIAN CROSSING

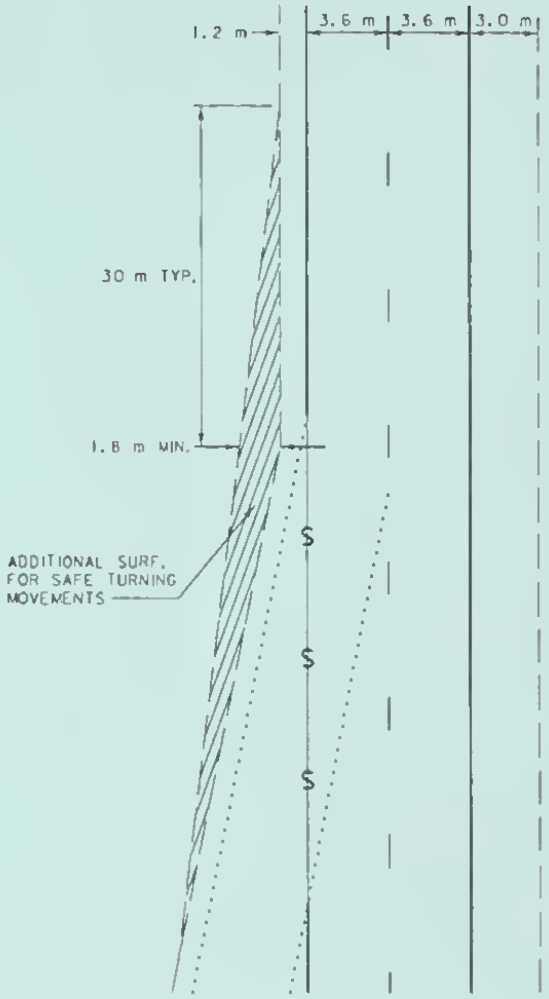
EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD




FOR LANE CLOSURE, USE THE NO FLAGGER APPLICATIONS OF THE WORK ZONE LAYOUTS FROM DTL. DWG. NO. 618-22 (AT PROJECT LIMIT) AND 618-24 (WITHIN PROJECT LIMITS)

ADDITIONAL SURFACING TO ALLOW FOR SAFE TURNING MOVEMENTS (SEE DETAIL FOR DIMENSIONS)



ADDITIONAL SURFACING DETAIL

LEGEND

—⩘—	OBLITERATE OR PAINT OVER EXISTING PAVEMENT MARKINGS
○	PLASTIC DRUMS SPACED PER THE MUTCD
······	PLASTIC PAVEMENT MARKING TABS AT 1.5 m SPACING
— — —	PLASTIC PAVEMENT MARKING TABS AT 3.0 m SPACING
●	FLEXIBLE GLUE-DOWN GUIDE POSTS AT 30 m SPACING FOR LENGTH OF TWO-LANE EXCEPT AS NOTED

NOTES:

INCLUDE REGULATORY SIGNING ONLY AS REQUIRED. MODIFY REGULATORY SIGNS TO MATCH ADJACENT REGULATIONS.

SEE DTL. DWG. NO. 618-30 FOR TYPICAL CROSS-OVER SECTION DIMENSIONS.

INDICATED SPACINGS ARE INTENDED TO BE A MAXIMUM AND MAY BE REDUCED IF CONDITIONS WARRANT.

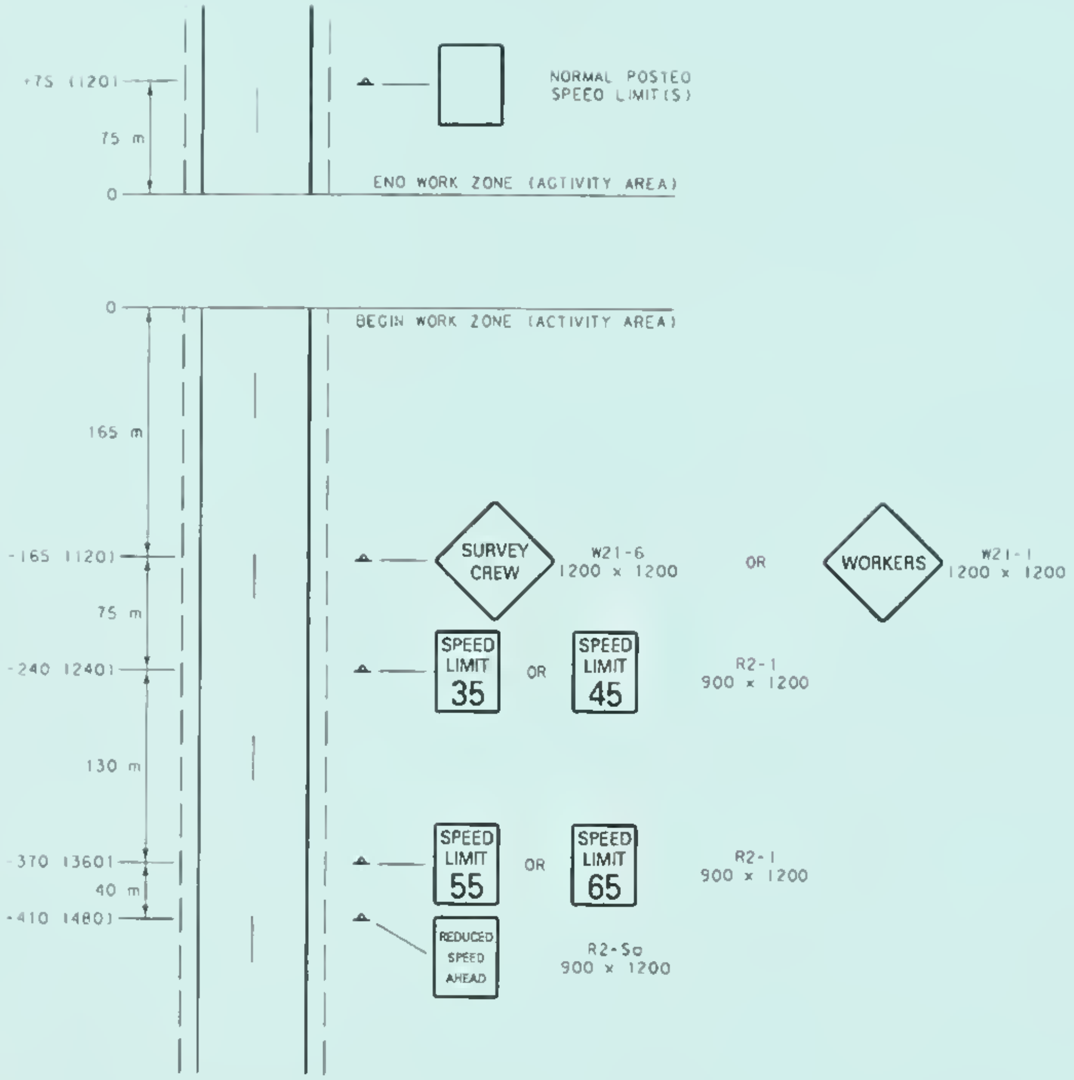
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 618
DWG. NO.
618-32

TEMPORARY
TWO-LANE TO FOUR-LANE
MEDIAN CROSSING

EFFECTIVE: AUGUST 1999

MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



NOTES:

SHORT DURATION ACTIVITIES ARE DEFINED AS THOSE LASTING UP TO ONE HOUR.

USE THIS SIGN LAYOUT WHEN WORK IS TO TAKE PLACE ON THE TRAVELED WAY. SIGNING FOR WORK ON OR NEAR THE SHOULDER MAY BE LIMITED TO THE USE OF TWO 1200 mm WARNING SIGNS AND WORK OUTSIDE THE SHOULDER TO THE USE OF ONE 1200 mm WARNING SIGN.

SIGN BOTH TRAVEL DIRECTIONS ON TWO-LANE, TWO-WAY ROADWAYS OR BOTH SHOULDERS ON TWO-LANE, ONE-WAY ROADWAYS.

DISTANCES SHOWN IN PARENTHESES ARE FOR DELINEATOR MOUNTED SIGNS ONLY.

SEE DTL. DWG. NO. 618-36 "SHORT-TERM STATIONARY CREW SIGNING" IF THE DOUBLE PENALTY REGULATION IS TO BE UTILIZED.

DURATION - MUTCD: 6G-2

Short duration: up to 1 hr.
Traffic affected as control increases.
Simplified controls may be warranted.
Short-term stationary: 1 to 12 hr.
Most maintenance, survey work.
Reflective devices should be used.

61-8-314, MCA:

① Construction Zone may include a Work Zone.
② Separate speed limits can be set for each.
③ Post signs identifying the boundaries of each.
④ Double penalty applies only to Work Zone.
⑤ Double penalty must be posted at Construction Zone boundary.
⑥ Work Zone cannot exceed actual activity area more than 500 ft.

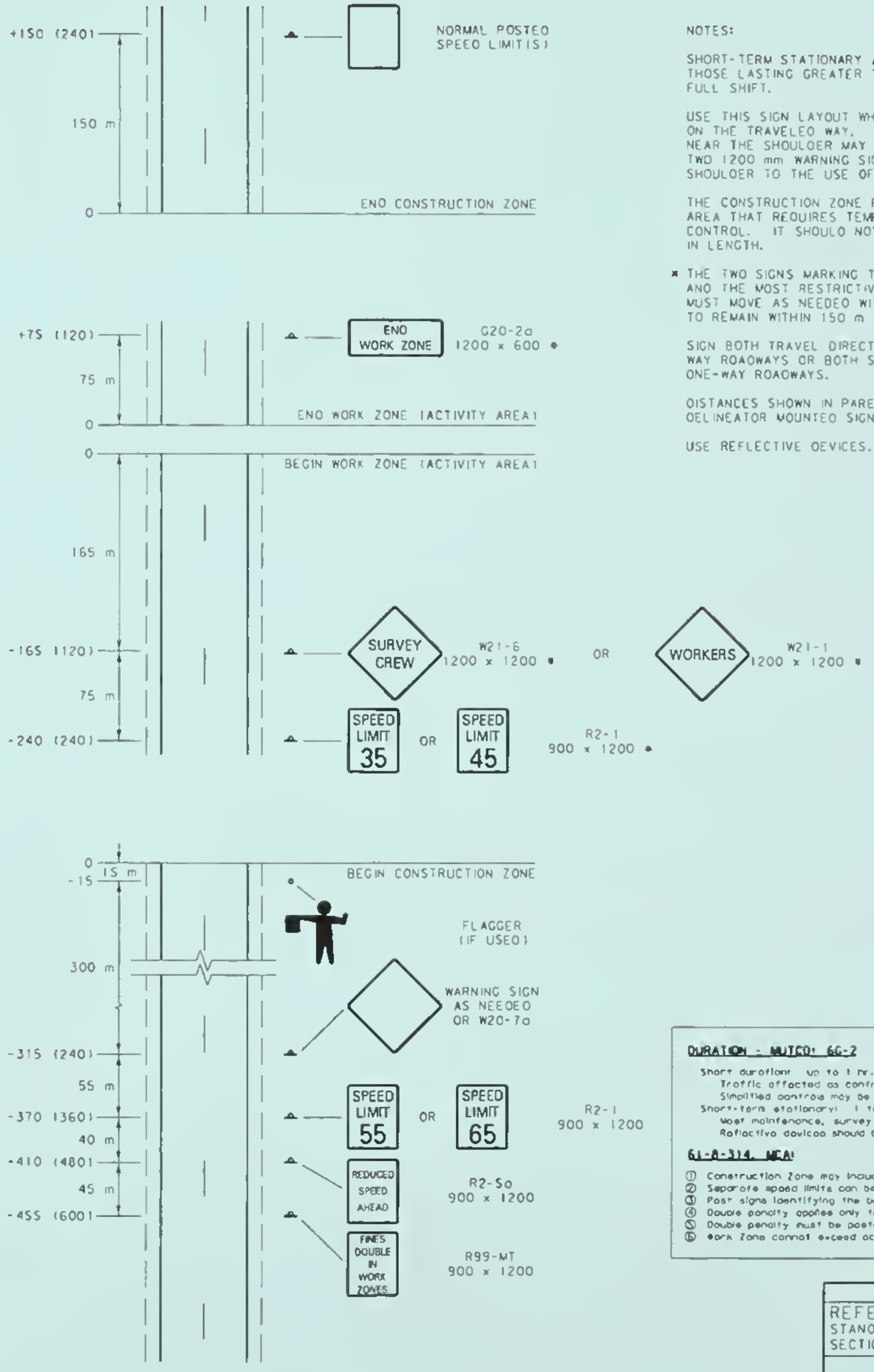
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 618
DWG. NO.
618-34

SHORT DURATION
CREW SIGNING

EFFECTIVE: AUGUST 1999

MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



NOTES:

SHORT-TERM STATIONARY ACTIVITIES ARE DEFINED AS THOSE LASTING GREATER THAN ONE HOUR, UP TO A FULL SHIFT.

USE THIS SIGN LAYOUT WHEN WORK IS TO TAKE PLACE ON THE TRAVELED WAY. SIGNING FOR WORK ON OR NEAR THE SHOULDER MAY BE LIMITED TO THE USE OF TWO 1200 mm WARNING SIGNS AND WORK OUTSIDE THE SHOULDER TO THE USE OF ONE 1200 mm WARNING SIGN.

THE CONSTRUCTION ZONE REFERS TO THE GENERAL AREA THAT REQUIRES TEMPORARY WORK ZONE TRAFFIC CONTROL. IT SHOULD NOT EXCEED 4.8 KILOMETERS IN LENGTH.

* THE TWO SIGNS MARKING THE WORK ZONE BOUNDARIES AND THE MOST RESTRICTIVE REGULATORY SPEED SIGN MUST MOVE AS NEEDED WITHIN THE CONSTRUCTION ZONE TO REMAIN WITHIN 150 m OF THE WORK ACTIVITY.

SIGN BOTH TRAVEL DIRECTIONS ON TWO-LANE, TWO-WAY ROADWAYS OR BOTH SHOULDERS ON TWO-LANE, ONE-WAY ROADWAYS.

DISTANCES SHOWN IN PARENTHESES ARE FOR DELINEATOR MOUNTED SIGNS ONLY.

USE REFLECTIVE DEVICES.

DURATION - MUTCD: 6G-2

Short duration: up to 1 hr.
Traffic affected as control increases.
Simplified controls may be warranted.
Short-term stationary: 1 to 12 hr.
Most maintenance, survey work.
Reflective devices should be used.

61-8-314, MCA:

① Construction Zone may include a Work Zone.
② Separate speed limits can be set for each.
③ Post signs identifying the boundaries of each.
④ Double penalty applies only to Work Zone.
⑤ Double penalty must be posted at Construction Zone boundary.
⑥ Work Zone cannot exceed actual activity area more than 500 ft.

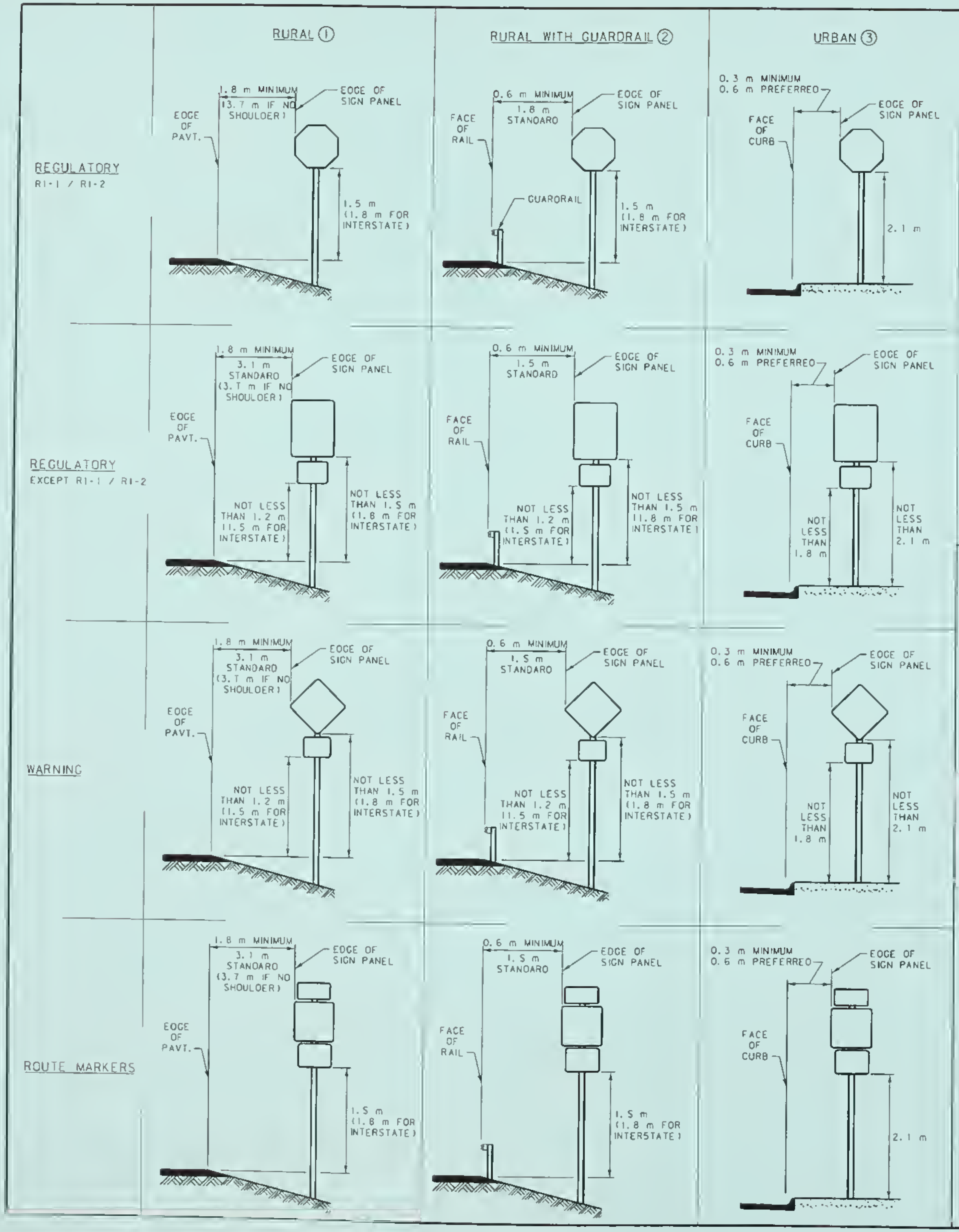
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 618
DWG. NO.
618-36

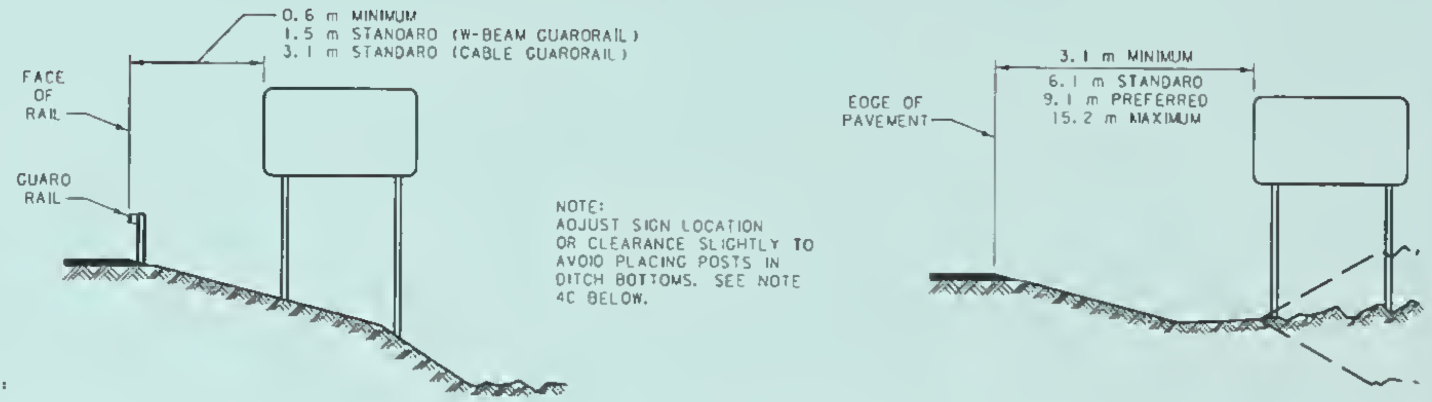
SHORT-TERM
STATIONARY
CREW SIGNING

EFFECTIVE: AUGUST 1999

MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



GUIDE SIGNS



NOTE:
ADJUST SIGN LOCATION OR CLEARANCE SLIGHTLY TO AVOID PLACING POSTS IN DITCH BOTTOMS. SEE NOTE 4C BELOW.

NOTES:

1. PLACE ALL SIGNS AT THE CLEARANCE AND MOUNTING HEIGHTS SHOWN.

2. FOR REGULATORY, WARNING AND ROUTE MARKER SIGNS, AND THEIR ASSEMBLIES, ON HIGHWAYS OTHER THAN INTERSTATE:
A) USE DIAGRAMS LOCATED IN COLUMN ① WHEN PLACING THESE SIGNS IN STANDARD RURAL CONDITIONS. USE COLUMN ② WHEN PLACING THESE SIGNS BEHIND GUARDRAIL IN RURAL CONDITIONS. USE COLUMN ③ WHEN PLACING THESE SIGNS IN URBAN CONDITIONS WHERE THERE IS ADEQUATE CLEARANCE AND SIDEWALK WIDTH.
B) WHERE SIDEWALK WIDTH IS LIMITED IN URBAN CONDITIONS, SEE DTL. DWG. NO. 619-18 FOR PLACEMENT DETAILS.

3. FOR REGULATORY (ALL OTHER), WARNING AND ROUTE MARKER SIGNS, AND THEIR ASSEMBLIES, ON INTERSTATE HIGHWAYS:
THE CLEARANCE IS 6.1 m FROM THE EDGE OF PAVEMENT IN COLUMN ① FOR STANDARD RURAL CONDITIONS. THE CLEARANCES LISTED IN COLUMNS ② AND ③ REMAIN AS SHOWN.

4. FOR GUIDE SIGNS AND THEIR ASSEMBLIES:
A) USE THE DIAGRAMS LOCATED ABOVE WHEN PLACING THESE SIGNS IN THE GIVEN RURAL CONDITIONS.
B) FOR PLACEMENT OF THESE SIGNS IN URBAN CONDITIONS, SEE THE SIGN LOCATION AND SPECIFICATION SHEETS IN THE SIGNING PLANS FOR EACH INDIVIDUAL SIGN.
C) THE MAXIMUM CLEARANCE OF THESE SIGNS IS 15.2 m IN ANY CONDITION.
D) SEE DTL. DWG. NO. 619-08 FOR MOUNTING HEIGHTS.

5. WITHIN THE CITY LIMITS OR IN A SIDEWALK AND CURB AREA, MOUNT SIGNS TO HAVE THE PROPER CLEARANCES, BUT AVOID ANY CONFLICT BETWEEN THE POST AND THE MAIN WALKING AREA OF THE SIDEWALK, OR WITH DOORWAYS OR WINDOWS OF ADJACENT BUILDINGS. THE EXACT LOCATION OF THESE SIGN INSTALLATIONS WILL BE DETERMINED BY THE ENGINEER. SEE DTL. DWG. NO. 619-18 FOR VARIOUS CANTILEVER TYPE MOUNTINGS.

6. EVALUATE SIGNS WITHIN CLEAR ZONES (TABLES BELOW) FOR SUPPORT BREAKAWAY REQUIREMENTS (CONTACT MDT TRAFFIC SECTION FOR CRITERIA).

CLEAR ZONE DISTANCES

(IN METERS FROM EDGE OF DRIVING LANE)

DESIGN SPEED	DESIGN ADT	FILL SLOPES			CUT SLOPES		
		6:1 OR FLATTER	5:1 TO 4:1	3:1	3:1	4:1 TO 5:1	6:1 OR FLATTER
60 km/h OR LESS	UNDER 750	2.0-3.0	2.0-3.0	**	2.0-3.0	2.0-3.0	2.0-3.0
	750-1499	3.0-3.5	3.5-4.5	**	3.0-3.5	3.0-3.5	3.0-3.5
	1500-6000	3.5-4.5	4.5-5.0	**	3.5-4.5	3.5-4.5	3.5-4.5
	OVER 6000	4.5-5.0	5.0-5.5	**	4.5-5.0	4.5-5.0	4.5-5.0
70-80 km/h	UNDER 750	3.0-3.5	3.5-4.5	**	2.5-3.0	2.5-3.0	3.0-3.5
	750-1499	4.5-5.0	5.0-6.0	**	3.0-3.5	3.5-4.5	4.5-5.0
	1500-6000	5.0-5.5	6.0-8.0	**	3.5-4.5	4.5-5.0	5.0-5.5
	OVER 6000	6.0-6.5	7.5-9.0	**	4.5-5.0	5.5-6.0	6.0-6.5
90 km/h	UNDER 750	3.5-4.5	4.5-5.5	**	2.5-3.0	3.0-3.5	3.0-3.5
	750-1499	5.0-5.5	6.0-7.5	**	3.0-3.5	4.5-5.0	5.0-5.5
	1500-6000	6.0-6.5	7.5-9.0	**	4.5-5.0	5.0-5.5	6.0-6.5
	OVER 6000	6.5-7.5	8.0-10.0 *	**	5.0-5.5	6.0-6.5	6.5-7.5
100 km/h	UNDER 750	5.0-5.5	6.0-7.5	**	3.0-3.5	3.0-3.5	4.5-5.0
	750-1499	6.0-7.5	8.0-10.0 *	**	3.5-4.5	5.0-5.5	6.0-6.5
	1500-6000	8.0-9.0	10.0-12.0 *	**	4.5-5.5	5.5-6.5	7.5-8.0
	OVER 6000	9.0-10.0 *	11.0-13.5 *	**	6.0-6.5	7.5-8.0	8.0-8.5
110 km/h	UNDER 750	5.5-6.0	6.0-8.0	**	3.0-3.5	4.5-5.0	4.5-4.9
	750-1499	7.5-8.0	8.5-11.0 *	**	3.5-5.0	5.5-6.0	6.0-6.5
	1500-6000	8.5-10.0 *	10.5-13.0 *	**	5.0-6.0	6.5-7.5	8.0-8.5
	OVER 6000	9.0-10.5 *	11.5-14.0 *	**	6.5-7.5	8.0-9.0	8.5-9.0

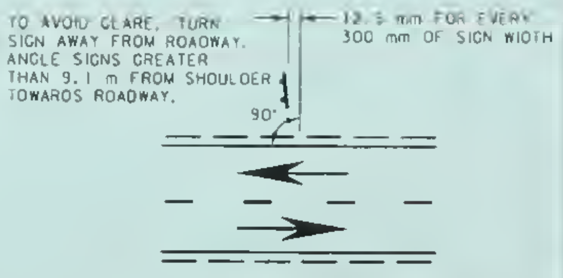
* WHEN AN INVESTIGATION OR ACCIDENT HISTORY INDICATES A HIGH PROBABILITY OF ACCIDENTS, CLEAR ZONE DISTANCES GREATER THAN 9 m MAY BE PROVIDED AS INDICATED. CLEAR ZONES MAY ALSO BE LIMITED TO 9 m TO PROVIDE A CONSISTENT ROADWAY TEMPLATE WHEN EXPERIENCE WITH PREVIOUS SIMILAR PROJECTS INDICATES SATISFACTORY PERFORMANCE.

** FIXED OBJECTS, INCLUDING SIGN POSTS, SHOULD NOT BE ALLOWED IN THE VICINITY OF THE TOE OF THESE SLOPES. SEE AASHTO ROADSIDE DESIGN GUIDE FOR ADDITIONAL CONSIDERATIONS IN LOCATING SIGNS.

HORIZONTAL CURVE ADJUSTMENTS

(APPLICALBLE ON OUTSIDE OF CURVE ONLY)

RADIUS (m)	DESIGN SPEED (km/h)					
	60	70	80	90	100	110
900	1.1	1.1	1.1	1.2	1.2	1.2
700	1.1	1.1	1.2	1.2	1.2	1.3
600	1.1	1.2	1.2	1.2	1.3	1.4
500	1.1	1.2	1.2	1.3	1.3	1.4
450	1.2	1.2	1.3	1.3	1.4	1.5
400	1.2	1.2	1.3	1.3	1.4	
350	1.2	1.2	1.4	1.4	1.5	
300	1.2	1.3	1.3	1.5	1.5	
250	1.3	1.3	1.4	1.5		
200	1.3	1.4	1.5			
150	1.4	1.5				
100	1.5					



TO AVOID GLARE, TURN SIGN AWAY FROM ROADWAY. ANGLE SIGNS GREATER THAN 9.1 m FROM SHOULDER TOWARDS ROADWAY.

SKEW DIAGRAM

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 619
DWG. NO.
619-00

SIGN CLEARANCES AND
MOUNTING HEIGHTS

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

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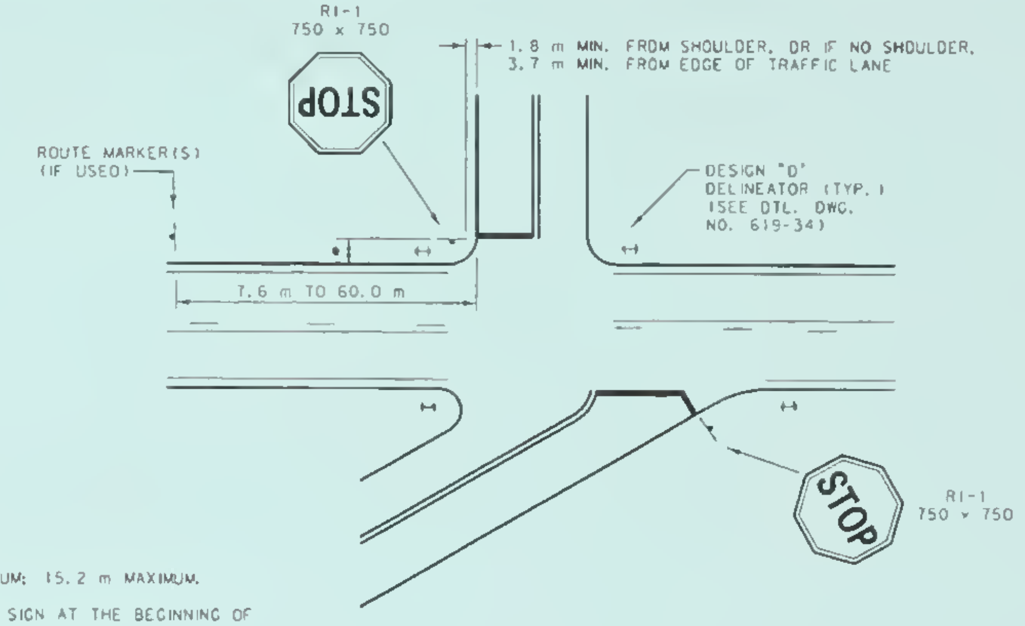


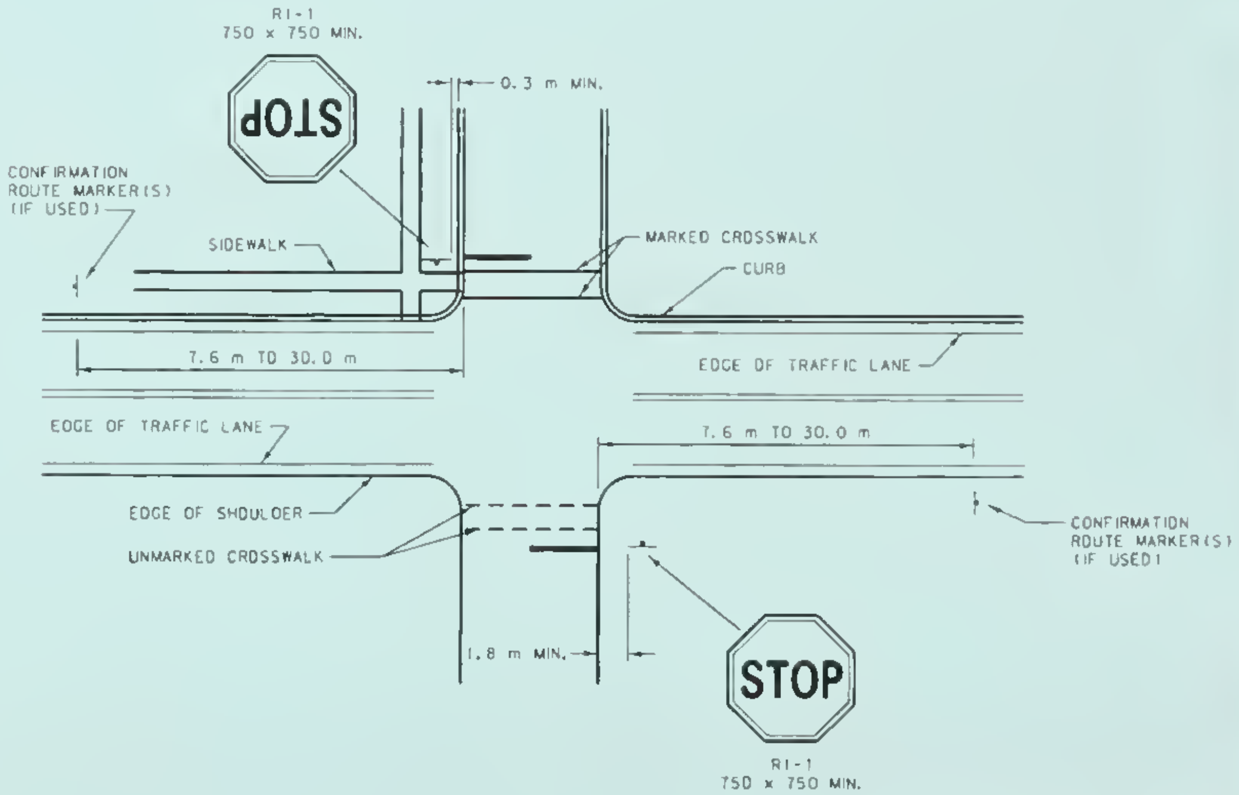
RURAL

NOTES:

* 1.8 m MINIMUM; 15.2 m MAXIMUM.

PLACE RI-1 SIGN AT THE BEGINNING OF CURB RADIUS OR SHOULDER RADIUS, OR 1.2 m MIN. IN ADVANCE OF THE MARKED OR UNMARKED CROSSWALK.

SEE PLANS FOR FINAL SIGNING AND PAVEMENT MARKING LOCATIONS.



URBAN

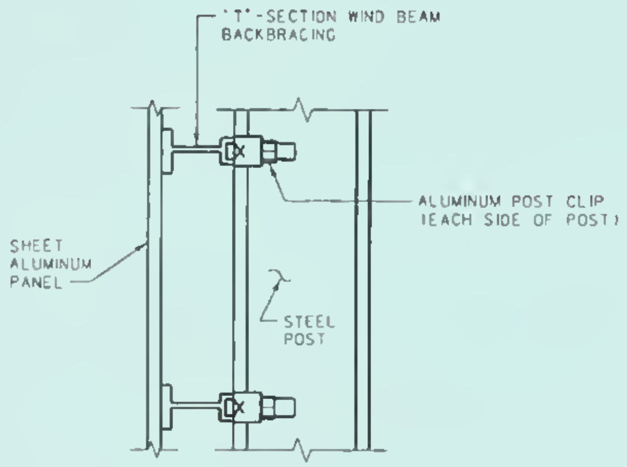
ALL DIMENSIONS ARE MILLIMETERS
(mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 619
DWG. NO.
619-02

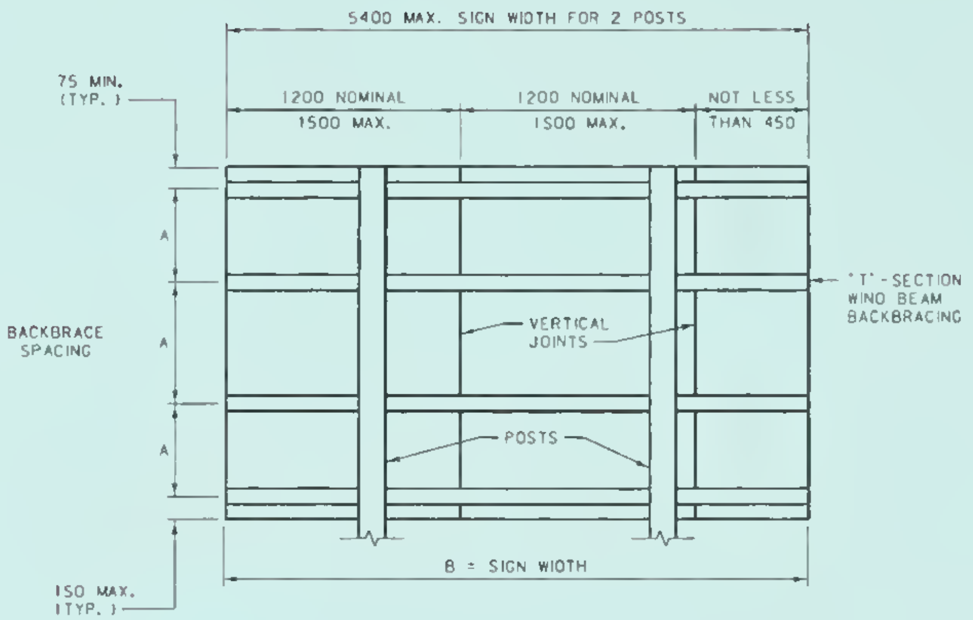
TYPICAL
RURAL AND URBAN
APPROACHES

EFFECTIVE: AUGUST 1999

MDT *MONTANA DEPARTMENT OF TRANSPORTATION*
MONTANA CADD

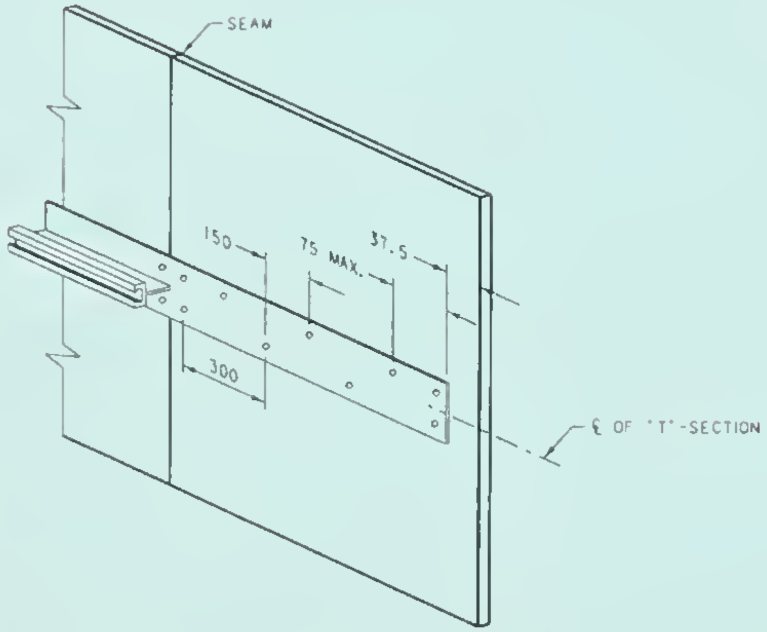

"T"-SECTION WIND BEAM BACKBRACING
ALUMINUM POST CLIP (EACH SIDE OF POST)
SHEET ALUMINUM PANEL
STEEL POST

BACKBRACE DETAIL



BACKBRACING TABLE - ALUMINUM SIGNS		
MAXIMUM BACKBRACE SPACING "A"	MAXIMUM WIDTH "B"	
	2 POST	3 POST
500	5400	8100
550	5100	7700
600	4950	7400
750	4425	6600
900	4050	6000
1050	3750	5550

FOR ALUMINUM PLATE THICKNESS INFORMATION SEE SECTION 704.01 OF THE STANDARD SPECIFICATIONS.

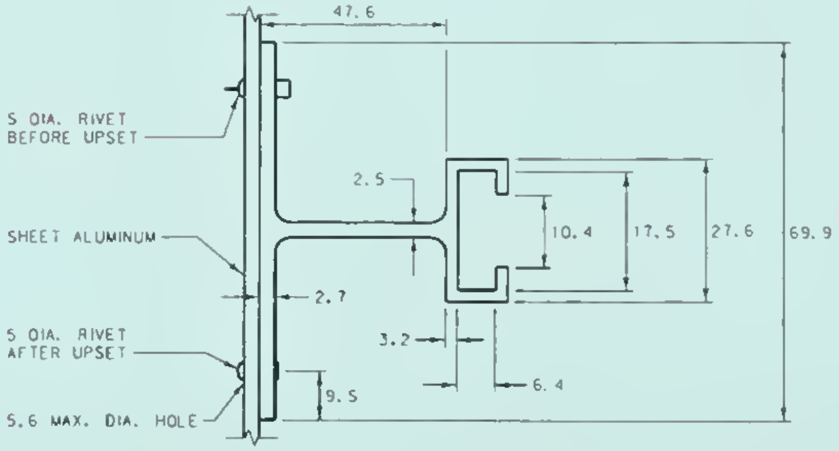


RIVET SPACING DETAIL

LOCATE RIVETS AT 150 mm ALTERNATE CENTERS ON HORIZONTAL EXTRUDED "T"-SECTION.

DOUBLE RIVETS (TOP AND BOTTOM OR LEFT AND RIGHT OF EXTRUDED "T"-SECTION) AT HORIZONTAL AND VERTICAL JOINTS IN SHEET ALUMINUM FACE AND AT ENDS OF EXTRUDED "T"-SECTION.

COLOR RIVET HEADS TO MATCH ADJACENT SHEETING.



EXTRUDED "T"-SECTION BACKBRACE

NOTES:

CONFORM ALL ALUMINUM SIGNS TO SECTIONS 619, 704.01.1 AND 704.01.2 OF THE STANDARD SPECIFICATIONS.

FOR SIGNS 1200 mm HIGH BY 1800 mm LONG OR LESS USE A SINGLE SHEET OF ALUMINUM.

DO NOT USE HORIZONTAL JOINTS ON SIGNS 1800 mm IN HEIGHT AND SMALLER. THE MINIMUM SHEET WIDTH IS 450 mm.

SIGNS OVER 1800 mm HIGH MAY HAVE HORIZONTAL AND VERTICAL JOINTS. THE MINIMUM SHEET SIZE IS 450 mm WIDE BY 450 mm HIGH.

CLEAN AND DRY POST CLIP NUTS, THEN TORQUE TO 25.4 N·m.

LOCATE ALL HORIZONTAL JOINTS AT A "T"-SECTION.

NO SPLICES ARE ALLOWED IN EXTRUDED "T"-SECTIONS.

USE SCREWS, BOLTS AND LOCKWASHERS THAT ARE ALUMINUM ALLOY MEETING ASTM B 211M FOR ALLOY 2024-T4, STAINLESS STEEL, OR CADMIUM PLATED STEEL MEETING ASTM B 766.

USE ONLY ALUMINUM RIVETS.

THE MAXIMUM GAP BETWEEN INDIVIDUAL SIGN PANELS AT JOINTS IS 1.6 mm AT ANY POINT.

THE ENGINEER MAY APPROVE ADDITIONAL METHODS TO PREVENT LIGHT LEAKAGE THROUGH SIGN PANEL SEAMS.

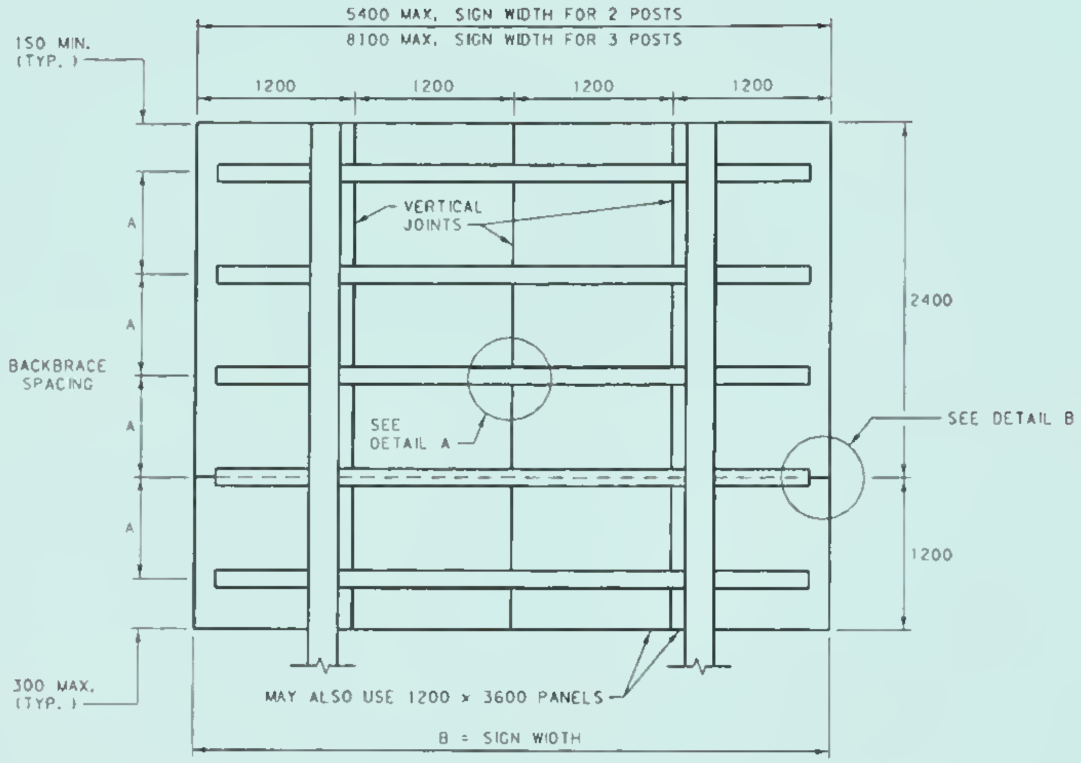
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

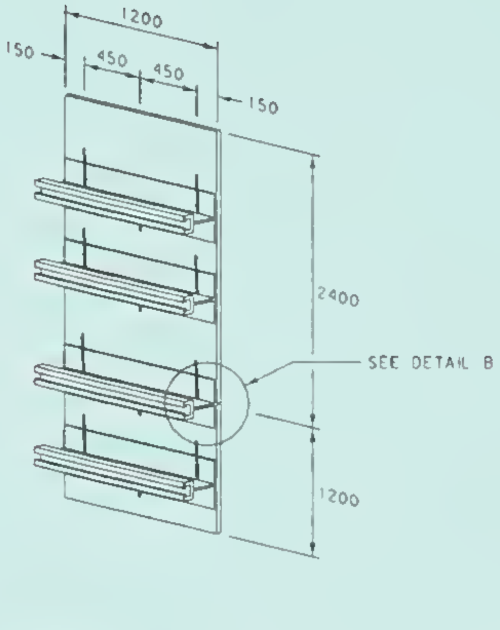
DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 619, 704
DWG. NO.
619-04

ALUMINUM SHEET
INCREMENT SIGN
CONSTRUCTION DETAILS

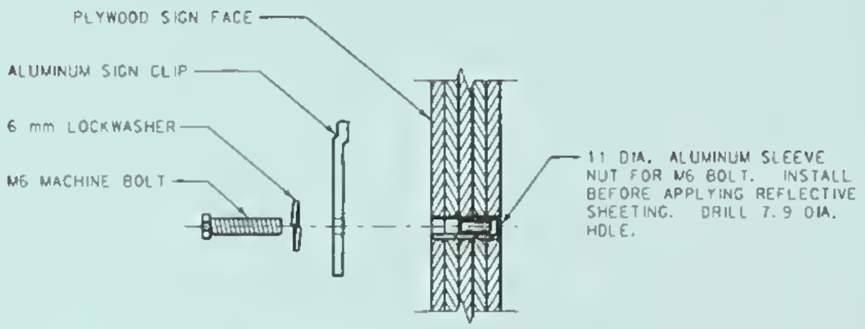
EFFECTIVE: AUGUST 1999

MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



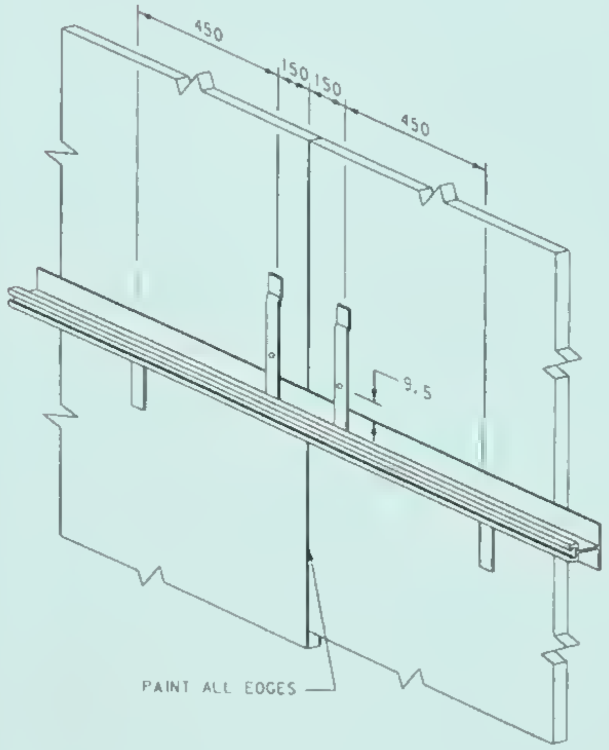


ALUMINUM CLIP PLACEMENT

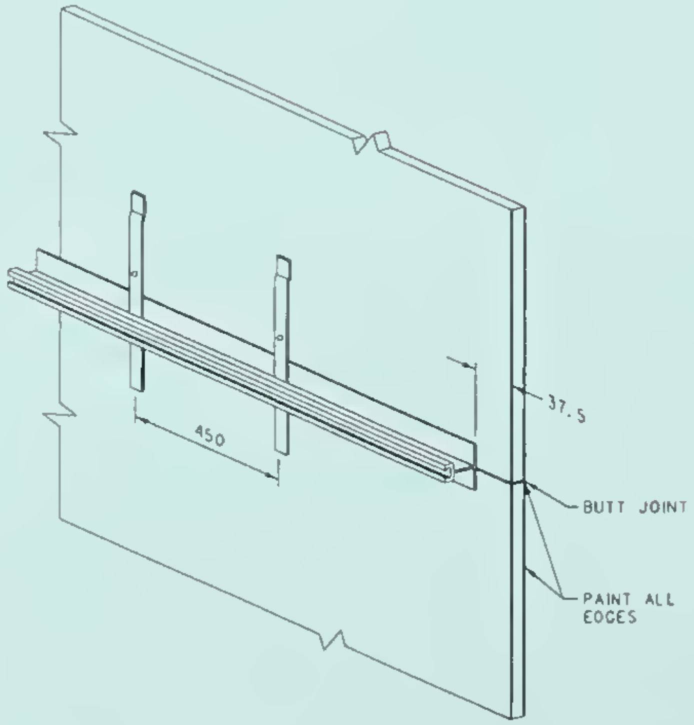

PLYWOOD SIGN FACE
ALUMINUM SIGN CLIP
6 mm LOCKWASHER
M6 MACHINE BOLT
11 DIA. ALUMINUM SLEEVE NUT FOR M6 BOLT. INSTALL BEFORE APPLYING REFLECTIVE SHEETING. DRILL 7.9 DIA. HOLE.

CLIP DETAIL

BACKBRACING TABLE - PLYWOOD SIGNS		
MAXIMUM BACKBRACE SPACING "A"	MAXIMUM WIDTH "B"	
	2 POST	3 POST
500	5400	8100
550	5100	7700
600	4950	7400
750	4425	6600
900	4050	6000
1050	3750	5550



DETAIL A
VERTICAL JOINT



DETAIL B
HORIZONTAL JOINT

NOTES:

CONFORM ALL PLYWOOD SIGNS TO SECTIONS 619, 704.01.3 AND 704.02.2 OF THE STANDARD SPECIFICATIONS.

ON SIGNS 1200 mm HIGH AND GREATER, DO NOT USE ANY PANELS LESS THAN 1200 mm IN HEIGHT.

DO NOT USE HORIZONTAL JOINTS ON SIGNS LESS THAN 1200 mm IN HEIGHT.

FOR SIGNS WITH WIDTHS THAT ARE NOT IN MULTIPLES OF 1200 mm, PLACE THE ODD LENGTH PANEL ON THE INSIDE EDGE.

FOR SIGNS OVER 3000 mm IN HEIGHT, THE FULL HEIGHT MAY BE OBTAINED WITH PANELS HAVING A FACTORY SCARFED JOINT IN LIEU OF USING STANDARD LENGTH PANEL AS SHOWN.

THE MINIMUM SIZE PANEL IS 450 mm WIDE BY 1200 mm HIGH.

CONSTRUCT PLYWOOD SIGNS OF ONE PIECE OF PLYWOOD UNLESS THE PLANS SPECIFY OTHERWISE FOR SPECIAL DESIGN SIGNS.

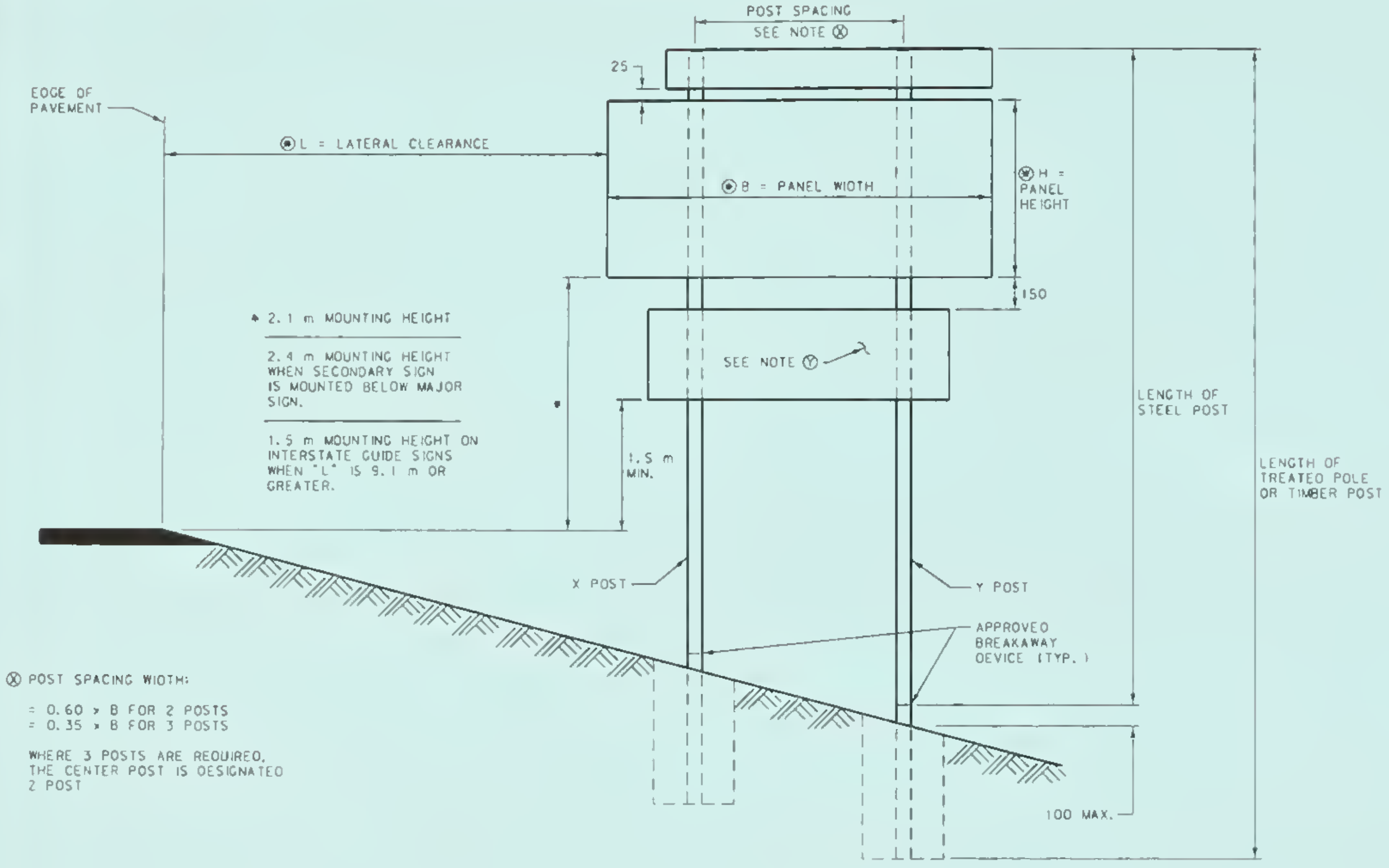
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 619, 704
DWG. NO.
619-06

PLYWOOD SHEET INCREMENT
GUIDE SIGN
CONSTRUCTION DETAILS

EFFECTIVE: AUGUST 1999

MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

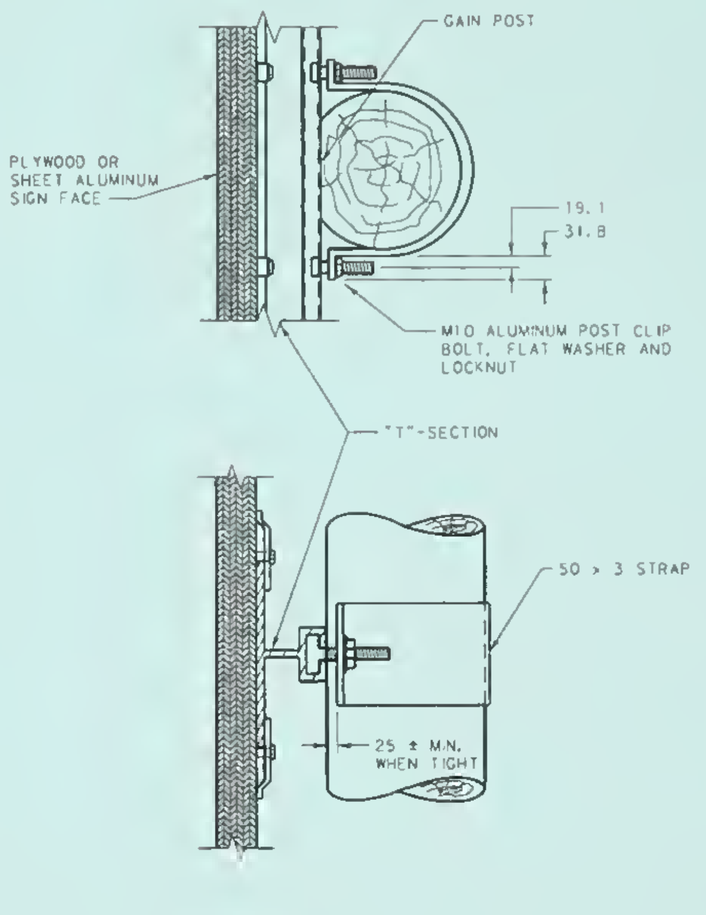

POST SPACING
SEE NOTE ⊗
25
EDGE OF PAVEMENT
⊙L = LATERAL CLEARANCE
⊙B = PANEL WIDTH
⊙H = PANEL HEIGHT
150
SEE NOTE Ⓨ
* 2.1 m MOUNTING HEIGHT
2.4 m MOUNTING HEIGHT WHEN SECONDARY SIGN IS MOUNTED BELOW MAJOR SIGN.
1.5 m MOUNTING HEIGHT ON INTERSTATE GUIDE SIGNS WHEN "L" IS 9.1 m OR GREATER.
1.5 m MIN.
LENGTH OF STEEL POST
LENGTH OF TREATED POLE OR TIMBER POST
X POST
Y POST
APPROVED BREAKAWAY DEVICE (TYP.)
100 MAX.

⊗ POST SPACING WIDTH:

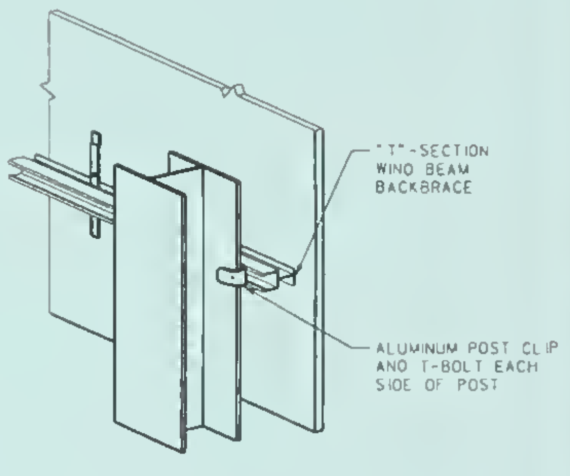
= 0.60 × B FOR 2 POSTS
= 0.35 × B FOR 3 POSTS

WHERE 3 POSTS ARE REQUIRED, THE CENTER POST IS DESIGNATED Z POST

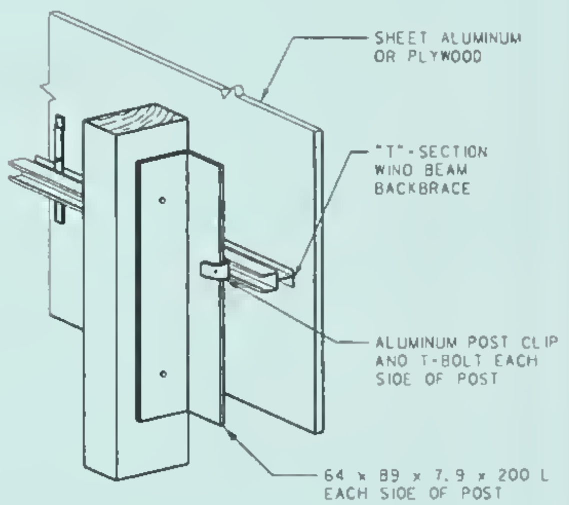
MOUNTING DETAILS


GAIN POST
PLYWOOD OR SHEET ALUMINUM SIGN FACE
19.1
31.8
M10 ALUMINUM POST CLIP BOLT, FLAT WASHER AND LOCKNUT
"T"-SECTION
50 × 3 STRAP
25 ± MIN. WHEN TIGHT

TREATED POLE


"T"-SECTION WIND BEAM BACKBRACE
ALUMINUM POST CLIP AND T-BOLT EACH SIDE OF POST

STEEL POST


SHEET ALUMINUM OR PLYWOOD
"T"-SECTION WIND BEAM BACKBRACE
ALUMINUM POST CLIP AND T-BOLT EACH SIDE OF POST
64 × 89 × 7.9 × 200 L EACH SIDE OF POST

TREATED TIMBER POST

NOTES:

MOUNTING SYSTEMS SHOWN ARE TYPICAL. OTHER SYSTEMS MAY BE APPROVED BY THE ENGINEER.

ALL STEEL HARDWARE MUST BE GALVANIZED, STAINLESS, OR CADMIUM PLATED.

GAIN THE TOP HALF OF WOOD POLES ACCORDING TO THE TABLE ON DTL. DWG. NO. 619-20.

SEE THE SIGNING QUANTITIES FOR THE TYPES OF POSTS AND FOUNDATIONS.

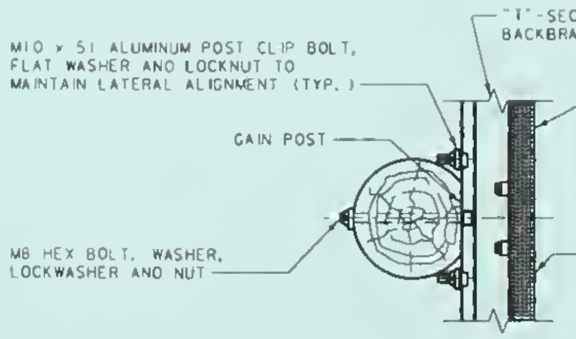
MOUNT ONE-PANEL PLYWOOD SIGNS DIRECTLY TO WOOD POLES OR POSTS, WHEN SPECIFIED IN THE PLANS, BY BOLTING THROUGH THE SIGN PLATE AND THE POLE WITH CADMIUM PLATED BOLTS AS REQUIRED BY THE DETAILED DRAWINGS, SPECIFICATIONS AND DESIGN. USE "T"-SECTION WIND BEAMS WHEN REQUIRED BY DTL. DWG. NO. 619-06.

Ⓨ SUSPEND LARGE SUPPLEMENTAL SIGNS, ADDED AFTER INITIAL SIGN INSTALLATION, FROM MAJOR SIGN PANEL OR BACKBRACING. ATTACHMENT TO MULTIPLE POSTS/POLES IS NOT ALLOWED.

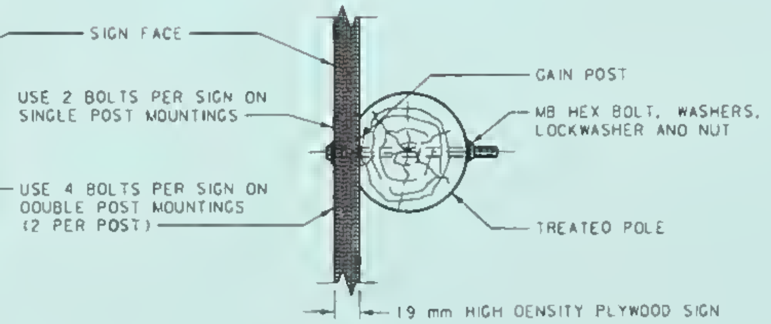
USE POST SPACING, POST SIZE AND BREAKAWAY DEVICES SPECIFIED IN THE PLANS AND IN THE SPECIFICATIONS. FOR INFORMATION REGARDING APPROPRIATE BREAKAWAY DEVICES FOR NEW INSTALLATIONS NOT SUPPORTED BY THE PLANS, CONTACT THE TRAFFIC UNIT.

IN LOCATING SIGNS, AVOID PLACING POSTS IN DITCH BOTTOMS WHERE THEY WOULD IMPEDE DRAINAGE.

⊙ DIMENSIONS ARE SPECIFIED IN THE SIGNING PLANS.


M10 × 51 ALUMINUM POST CLIP BOLT, FLAT WASHER AND LOCKNUT TO MAINTAIN LATERAL ALIGNMENT (TYP.)
"T"-SECTION BACKBRACE
GAIN POST
M8 HEX BOLT, WASHER, LOCKWASHER AND NUT

DOUBLE POLE MOUNT


SIGN FACE
USE 2 BOLTS PER SIGN ON SINGLE POST MOUNTINGS
USE 4 BOLTS PER SIGN ON DOUBLE POST MOUNTINGS (2 PER POST)
GAIN POST
M8 HEX BOLT, WASHERS, LOCKWASHER AND NUT
TREATED POLE
19 mm HIGH DENSITY PLYWOOD SIGN

TREATED POLE SINGLE OR DOUBLE

(USED WHEN "T"-BAR WIND BEAMS NOT REQUIRED)

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

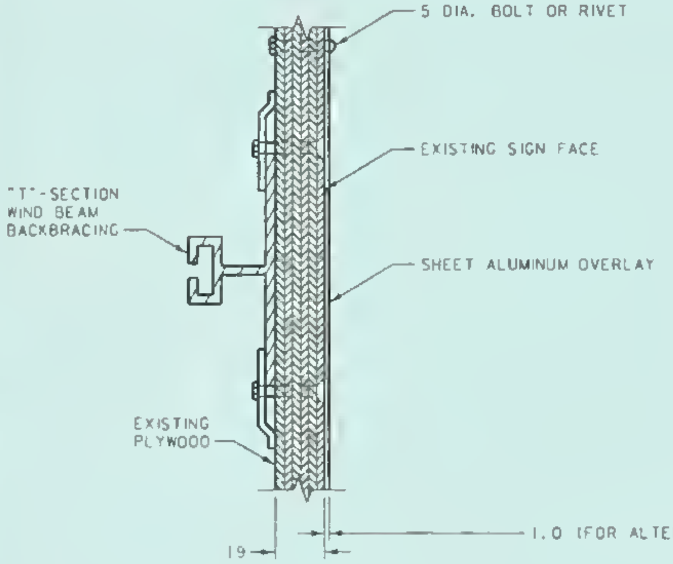
DETAILED DRAWING

REFERENCE	DWG. NO.
STANDARD SPEC. SECTION 619.704	619-08

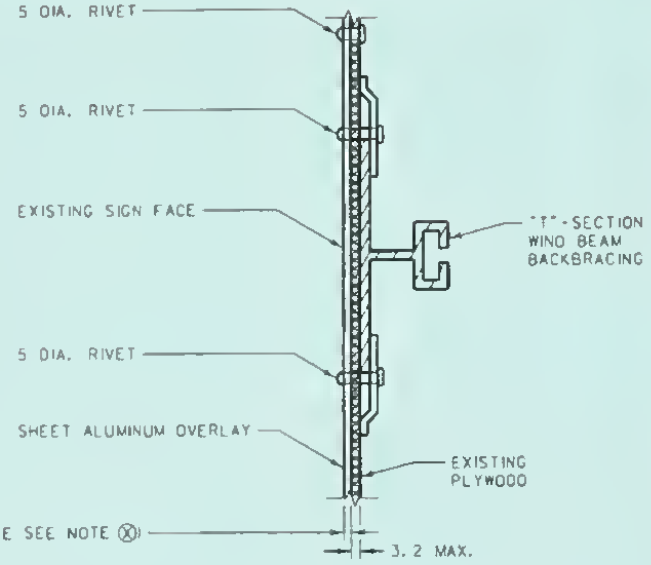
GUIDE SIGN CLEARANCE
AND MOUNTING DETAILS

EFFECTIVE: AUGUST 1999

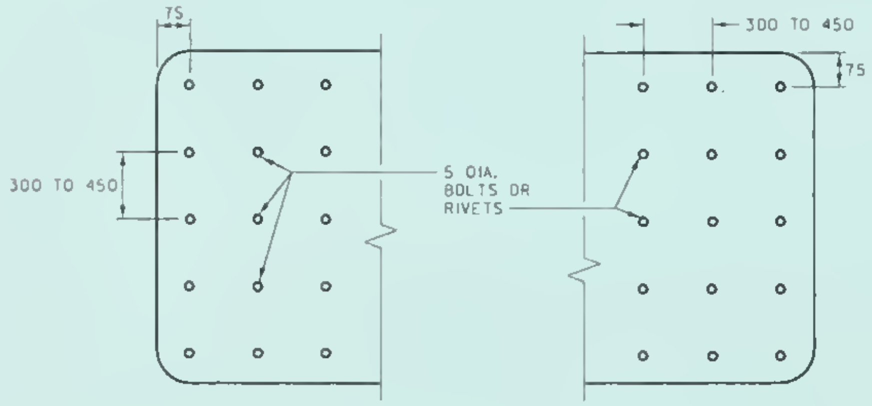
MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



EXISTING PLYWOOD SIGNS



EXISTING ALUMINUM SIGNS



FASTENER PATTERN

NOTES:

REMOVE ALL RAISED LETTERS, NUMERALS, SYMBOLS, BORDERS AND PREVIOUS SIGN OVERLAYS TO BE REPLACED, AND CLEAN SIGN FACE TO A SMOOTH SURFACE BEFORE OVERLAYING.

ALL LETTERS, NUMERALS, SYMBOLS AND BORDERS ARE TYPE "C" CUTOUT UNLESS OTHERWISE SPECIFIED, AND APPLIED TO THE BACKGROUND SHEETING PRIOR TO FIELD APPLICATION OF THE SIGN.

THE SIZE OF ALL GUIDE SIGN OVERLAYS AND LEGENDS MUST BE VERIFIED BY THE ENGINEER PRIOR TO FABRICATION.

⊗ AN ADHESIVE-BACKED SHEETING MAY BE USED AS AN ALTERNATIVE ON SIGN WIDTHS OF 1800 mm OR LESS IF IT IS PREFABRICATED TO A MINIMUM THICKNESS OF 0.13 mm AND CONSTRUCTED OF PREAPPLIED REFLECTIVE SHEETING ON ADHESIVE-BACKED ALUMINUM. APPLY ADHESIVE-BACKED OVERLAY SHEETING WHEN AIR AND SURFACE TEMPERATURES ARE ABOVE 10°C. DO NOT USE THIS TYPE OF OVERLAY MATERIAL ON OVERHEAD SIGNS.

PROVIDE A MINIMUM REFLECTIVE SHEETING INTENSITY OF ENGINEERING GRADE, MEETING THE REQUIREMENTS OF THE STANDARD SPECIFICATIONS, UNLESS SPECIFIED OTHERWISE.

APPLY ALL MATERIALS IN ACCORDANCE WITH THE MANUFACTURER'S SPECIFICATIONS AND RECOMMENDATIONS.

SEE THE STANDARD SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

USE ALUMINUM ALLOY TYPE 6061-T6 OR AA5052-H38. CONVERSION COAT ALL ALUMINUM WITH A PROCESS SUCH AS ALODINE 1200 (OR EQUAL), AND RINSE AND DRY THOROUGHLY. PROTECT IT FROM SOIL BY ACCEPTABLE METHODS.

SIGN OVERLAYS MAY REQUIRE REMOVAL OF THE SIGN FROM THE POSTS TO AVOID PROJECTING BOLT HEADS. DO NOT LEAVE WARNING AND REGULATORY SIGNS TO BE OVERLAYED UNDISPLAYED FOR MORE THAN ONE (1) HOUR DURING DAYLIGHT. DO NOT LEAVE GUIDE SIGNS UNDISPLAYED FOR MORE THAN TEN (10) HOURS DURING DAYLIGHT. INSURE SIGNS TO BE OVERLAYED ARE OPERATIONAL PRIOR TO DARKNESS.

OVERLAY SIGNS SMALLER THAN 1200 mm x 1800 mm WITH ONE PANEL OF MATERIAL. FOR SEAMS IN LARGE OVERLAYS, USE RIVETS OR BOLTS SPACED AS SHOWN ON THIS DRAWING AND PLACE PARALLEL TO AND NO MORE THAN 75 mm LATERALLY FROM THE SEAM.

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING

REFERENCE STANDARD SPEC. SECTION 619	DWG. NO. 619-10
SHEET ALUMINUM OVERLAY	
EFFECTIVE: AUGUST 1999	
MDT MONTANA DEPARTMENT OF TRANSPORTATION	MONTANA CADD

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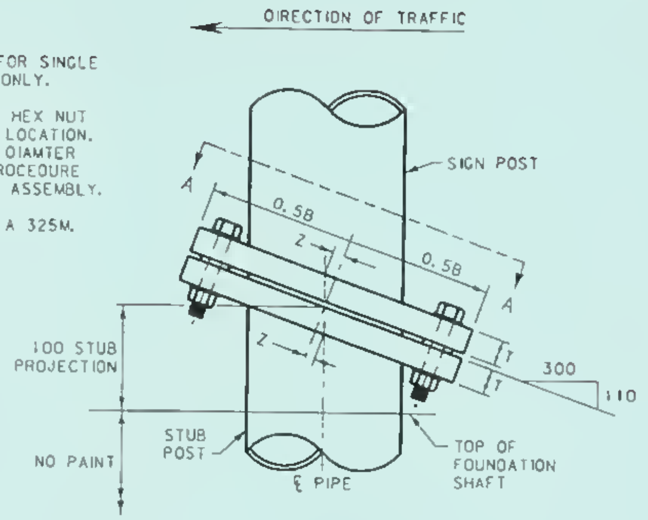
NOTES:

USE TUBULAR POSTS FOR SINGLE POST MOUNTED SIGNS ONLY.

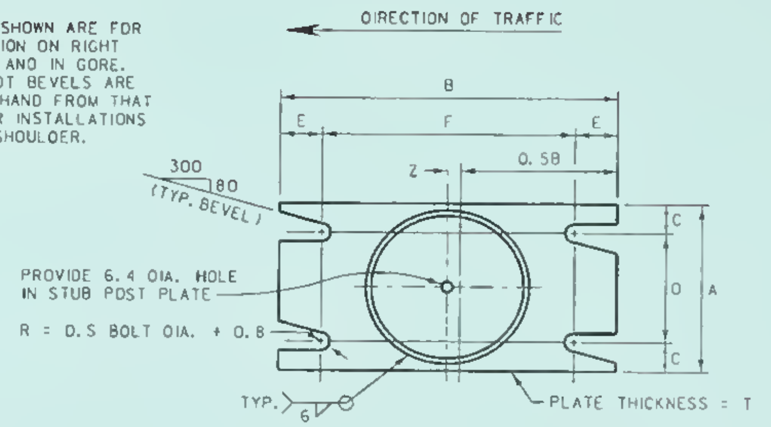
BOLT WITH HEX HEAD, HEX NUT AND 3 WASHERS EACH LOCATION. SEE TABLE FOR BOLT DIAMTER AND TORQUE. SEE PROCEDURE FOR BASE CONNECTION ASSEMBLY.

ALL BOLTS ARE ASTM A 325M.



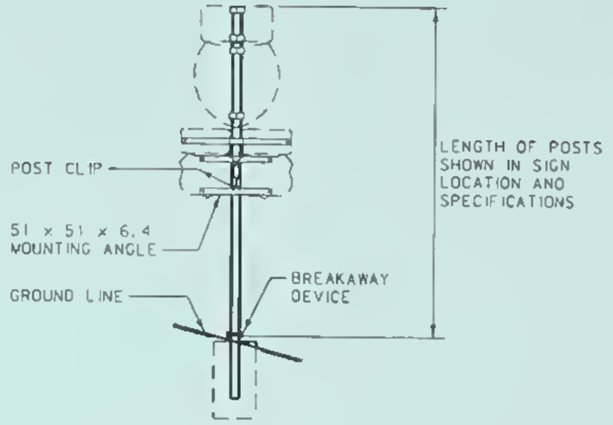
SIGN POST AND STUB POST DETAILS

SECTIONS SHOWN ARE FOR INSTALLATION ON RIGHT SHOULDER AND IN GORE. PLATE SLOT BEVELS ARE OPPOSITE HAND FROM THAT SHOWN FOR INSTALLATIONS ON LEFT SHOULDER.



SECTION A-A

BASE PLATE DETAIL

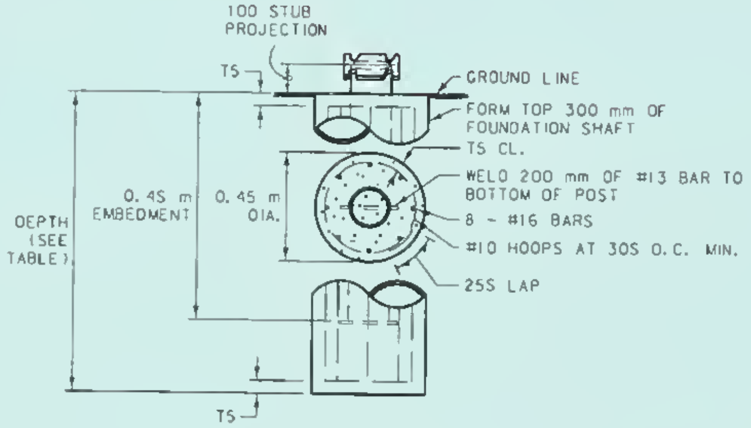

POST CLIP
51 x 51 x 6.4 MOUNTING ANGLE
GROUND LINE
BREAKAWAY DEVICE
LENGTH OF POSTS SHOWN IN SIGN LOCATION AND SPECIFICATIONS

TYPICAL SIGN ELEVATION

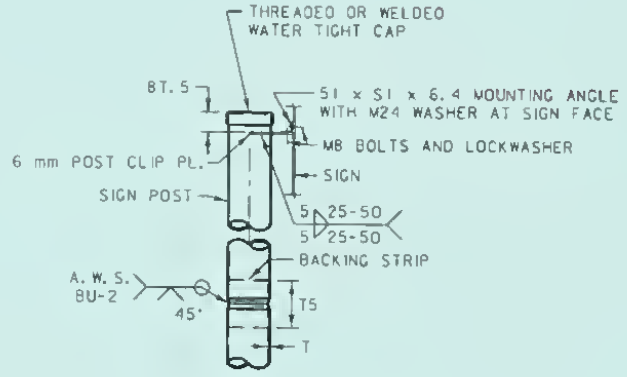
FOR DETAILS OF MOUNTING ANGLES SEE DETAILED DRAWING NUMBER 619-16 AND BELOW.

PROCEDURE FOR BASE CONNECTION ASSEMBLY

1. ASSEMBLE POST TO STUB WITH BOLTS AND ONE FLAT WASHER BETWEEN PLATES.
2. SHIM AS REQUIRED TO PLUMB POST.
3. TIGHTEN BOLTS IN A SYSTEMATIC ORDER TO THE PRESCRIBED TORQUE (SEE TABLE BELOW).
4. LOOSEN EACH BOLT AND RETIGHTEN TO PRESCRIBED TORQUE IN THE SAME ORDER AS ORIGINAL TIGHTENING. DO NOT OVERTIGHTEN.
5. BURR THREADS AT JUNCTION WITH NUT USING A CENTER PUNCH TO PREVENT NUT LOOSENING.

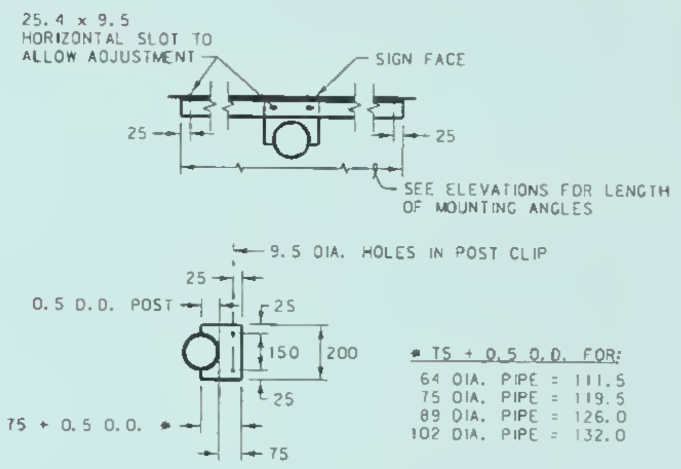


FOUNDATION SHAFT DETAIL

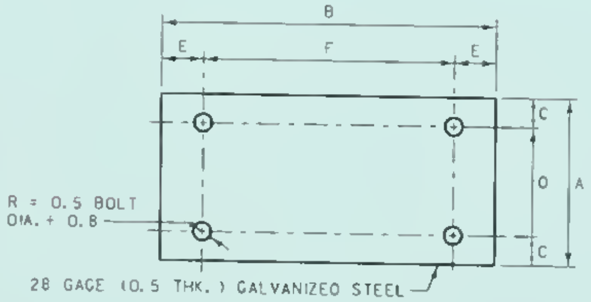


TYPICAL SPLICE

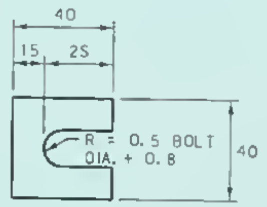
BACKING STRIP THICKNESS = T OR 8 mm MAX. LOCATE SPLICE IN TOP ONE-HALF OF POST.



POST CLIP DETAILS



KEEPER PLATE DETAIL



FURNISH TWO 0.3 mm ± THICK AND TWO 0.8 mm ± THICK SHIMS PER POST. USE SHIMS FABRICATED FROM BRASS SHIM STOCK OR STRIP CONFORMING TO ASTM B 36M.

SHIM DETAIL

NOTES:

USE STEEL PIPE CONFORMING TO THE REQUIREMENTS OF ASTM A 53, TYPE E OR S, GRADE B OR A 500, GRADE B.

USE CLASS "A" OR "D" CONCRETE WITH A WOOD FLOAT FINISH ON TOP. FORM TOP 300 mm OF FOUNDATION.

SEE THE STANDARD SPECIFICATIONS FOR REQUIREMENTS GOVERNING STRUCTURAL STEELS AND THEIR FABRICATION.

SUBMIT SHOP PLANS FOR APPROVAL PRIOR TO FABRICATION.

FOR SIGN PLACEMENT AND DETAILS SEE THE SIGNING DETAILED DRAWINGS.

GALVANIZE PIPE AS PER AASHTO M 111.

EXCEPT AS OTHERWISE APPROVED BY THE ENGINEER, PAINT STRUCTURAL STEEL WITH ONE SHOP COAT AND ONE FIELD COAT OF ZINC RICH BASED PAINT AND ONE FIELD COAT OF ALUMINUM PAINT AS SPECIFIED IN THE STANDARD SPECIFICATIONS, ON ALL SURFACES NOT IN CONTACT WITH THE CONCRETE.

FRANGIBLE BOLT BREAKAWAY SYSTEMS APPROVED BY FHWA ARE ALLOWED TO BE USED IN PLACE OF THE DESIGN SHOWN HERE AS AN EQUAL OPTION (PER ENGINEER'S APPROVAL).

TABLE OF WEIGHTS		
NOMINAL PIPE DIA.	NOMINAL WEIGHT (kg/m) OF PIPE	WEIGHT OF EACH BREAKAWAY DEVICE & STUB POST (kg)
75	11.28	12.71
89	13.56	16.26
102	16.06	17.44
127	21.76	27.90
152	28.23	36.99

BASE CONNECTION DATA											FOUNDATION	
NOMINAL PIPE DIA.	BOLT SIZE	BOLT TORQUE	A	B	C	D	E	F	T	Z	FOOTING DIAMETER	FOOTING DEPTH
75	M12 x 63	27 N·m	115	190	25.8	63.4	19.1	151.8	19	8	0.45 m	0.9 m
89 & 102	M12 x 63	27 N·m	140	215	25.6	88.8	18.6	177.8	19	8	0.45 m	0.9 m
127	M16 x 83	54 N·m	165	250	31.7	101.6	23.4	203.2	25	10	0.45 m	1.2 m
152	M20 x 89	88 N·m	190	285	31.5	127.0	25.0	235.0	25	10	0.45 m	1.4 m

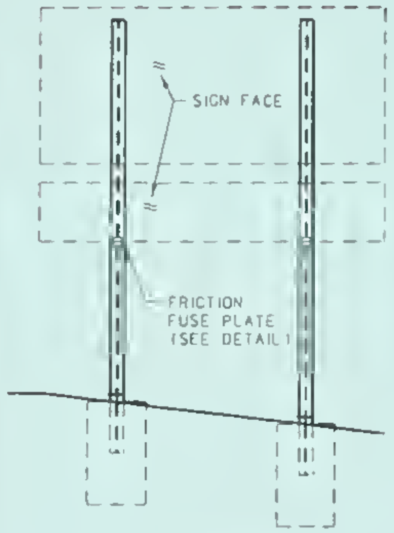
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 556.619.704
DWG. NO.
619-12

TUBULAR SIGN POST
DETAILS

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



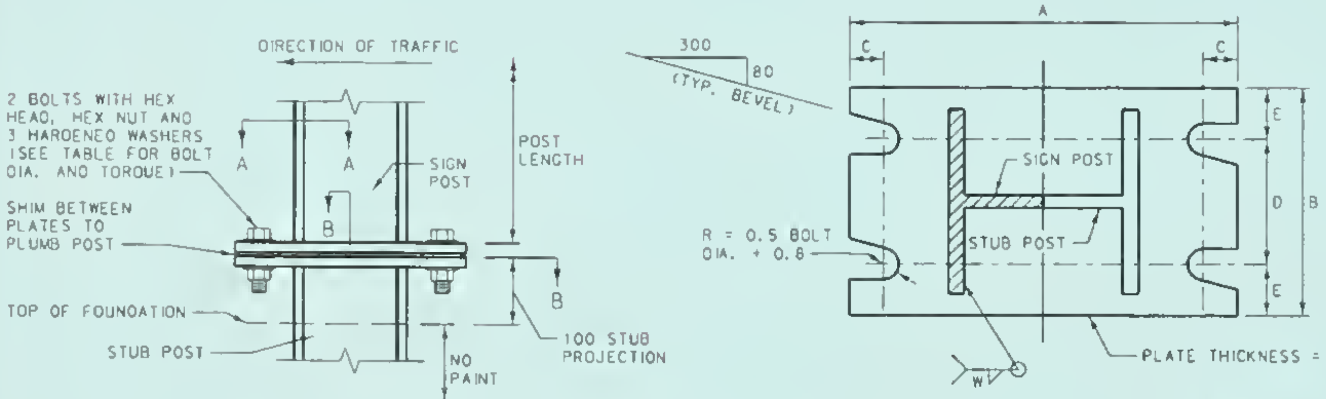
TYPICAL SIGN ELEVATION

BASE CONNECTION DATA											FUSE PLATE DATA										FOUNDATION DATA				
POST SIZE mm × kg/m	BOLT SIZE	BOLT TORQUE	DIMENSIONS							BREAKAWAY DEVICE (kg)	DIMENSIONS								BOLT DIA.	FUSE DEVICE (kg)	FTG. DEPTH	STUB LENGTH	FTG. DIA.	BAR C SIZE	STUB POST (kg)
			A	B	C	D	E	t_1	W		F	G	H	J	K	L	N	t_3							
W100 × 19 M100 × 19.3	M16 × 70	54 N·m	215	125	18.6	69.8	27.6	19	8	9.79	95	50.8	28.2	100	57.2	21.4	16.0	10	M16	0.73	1.1 m	600	0.45 m	#16	11.79
W200 × 27			320	160	20.3	101.6	29.2	19	8	16.78	115	63.5	31.5	135	69.8	32.6	20.0	13	M20	1.48	1.7 m	750	0.60 m	#22	20.41
W200 × 36	M20 × 89	88 N·m	330	190	19.0	127.0	31.5	25	8	27.61	120	63.5	36.5	150	88.8	30.6	20.0	14	M20	2.11	2.1 m	900	0.60 m	#29	32.66
W310 × 45			430	190	21.3	127.0	31.5	25	8	35.63	135	76.2	38.8	165	88.8	38.1	22.0	14	M22	2.46	2.4 m	900	0.75 m	#29	40.82
S75 × 8	M12 × 63	27 N·m	205	75	20.0	38.0	18.5	16	6	4.70	80	38.1	29.9	65	38.0	13.5	12.0	6	M12	0.29	1.1 m	450	0.45 m	#13	3.88
S100 × 11			205	75	20.0	38.0	18.5	16	6	4.74	80	38.1	29.9	65	38.0	13.5	12.0	6	M12	0.29	1.1 m	450	0.45 m	#13	5.24
S130 × 15	M16 × 70	54 N·m	240	100	18.4	50.8	24.6	19	6	8.65	80	38.1	29.9	75	47.6	13.7	12.0	6	M12	0.30	1.1 m	450	0.45 m	#16	6.80

PROCEDURE FOR BASE CONNECTION ASSEMBLY

1. ASSEMBLE POST TO STUB WITH BOLTS AND ONE FLAT WASHER BETWEEN PLATES.
2. SHIM AS REQUIRED TO PLUMB POST.
3. TIGHTEN BOLTS IN A SYSTEMATIC ORDER TO THE PRESCRIBED TORQUE (SEE TABLE).
4. LOOSEN EACH BOLT AND RETIGHTEN TO PRESCRIBED TORQUE IN THE SAME ORDER AS ORIGINAL TIGHTENING. DO NOT OVERTIGHTEN.
5. BURR THREADS AT JUNCTION WITH NUT USING A CENTER PUNCH TO PREVENT NUT LOOSENING.

NOTE:
ALL BOLTS MUST BE ASTM A 325M AND BE TIGHTENED BY USE OF A DIRECT TENSION INDICATING DEVICE (LOAD INDICATING WASHER) IN ACCORDANCE WITH THE MANUFACTURER'S SPECIFICATIONS.



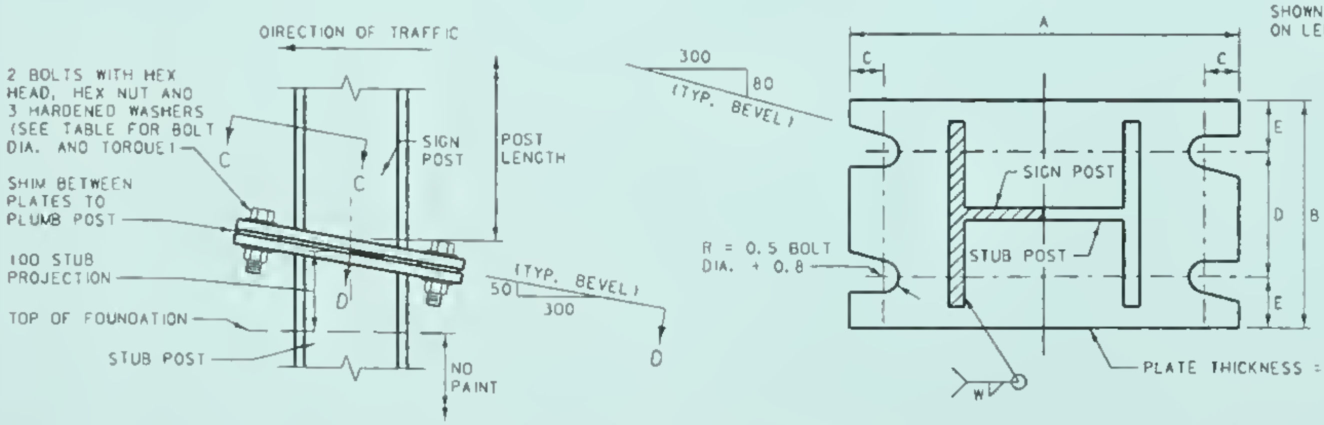
ELEVATION

SECTION A-A

SECTION B-B

SIGN POST AND STUB POST DETAIL "A"

NOTE:
SECTIONS SHOWN ARE FOR INSTALLATIONS ON RIGHT SHOULDER AND IN GORE. PLATE SLOT BEVELS ARE OPPOSITE HAND FROM THAT SHOWN FOR INSTALLATIONS ON LEFT SHOULDER.

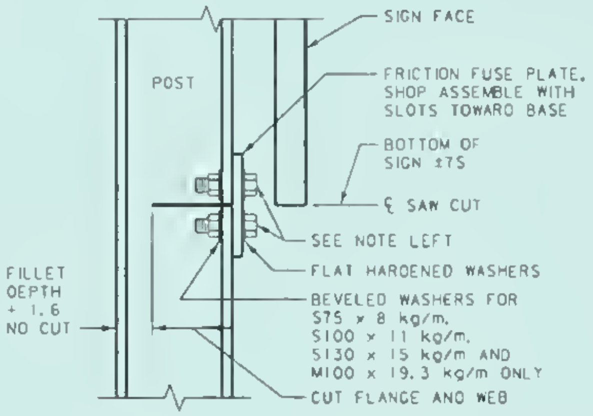


ELEVATION

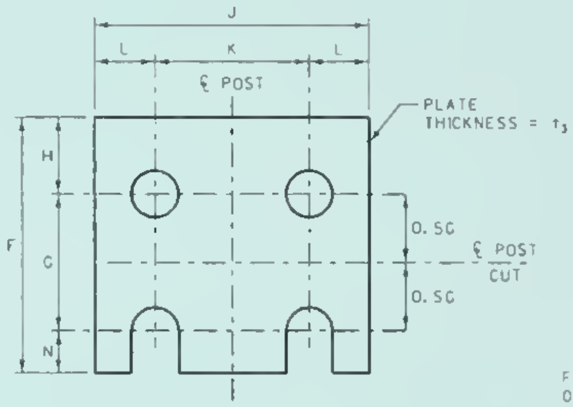
SECTION C-C

SECTION D-D

SIGN POST AND STUB POST DETAIL "B"
USE ONLY WITH SINGLE POST SIGNS

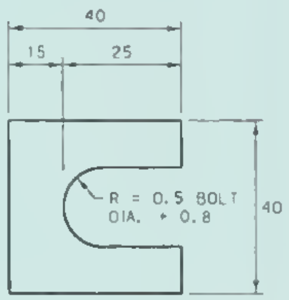

SIGN FACE
POST
FRICTION FUSE PLATE, SHOP ASSEMBLE WITH SLOTS TOWARD BASE
BOTTOM OF SIGN ±75
℄ SAW CUT
SEE NOTE LEFT
FLAT HARDENED WASHERS
BEVELED WASHERS FOR S75 × 8 kg/m, S100 × 11 kg/m, S130 × 15 kg/m AND M100 × 19.3 kg/m ONLY
FILLET DEPTH + 1.6 NO CUT
CUT FLANGE AND WEB

FRICTION FUSE PLATE DETAIL
DO NOT USE ON SINGLE POST SIGNS



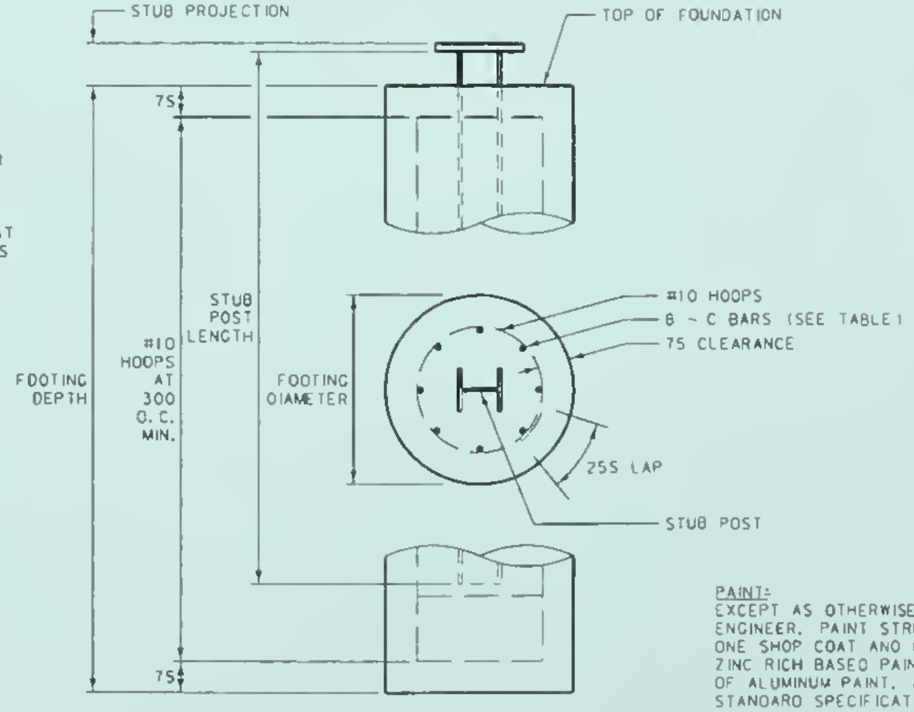
HOLE DIAMETER = BOLT DIA. + 1.6

FRICTION FUSE PLATE DETAIL



FURNISH TWO 0.3 mm ± THICK AND TWO 0.8 mm ± THICK SHIMS PER POST. USE SHIMS FABRICATED FROM BRASS SHIM STOCK OR STRIP CONFORMING TO ASTM B 36M.

SHIM DETAIL



FOUNDATION DETAIL

NOTES:

USE CLASS "A" OR "D" CONCRETE WITH A WOOD FLOAT FINISH ON TOP. FORM TOP 300 mm OF FOUNDATION.

SEE THE STANDARD SPECIFICATIONS FOR REQUIREMENTS GOVERNING STRUCTURAL STEELS AND THEIR FABRICATIONS. TO AVOID OVERSIGHT, NOTE THESE REQUIREMENTS ON THE SHOP DRAWINGS.

SUBMIT SHOP PLANS FOR APPROVAL BEFORE FABRICATION IS BEGUN.

THE WEIGHT OF STEEL POSTS IS COMPUTED BY TAKING THE LENGTH OF THE POST TIMES THE NOMINAL WEIGHT PER METER PLUS THE WEIGHT OF THE BREAKAWAY DEVICE, FUSE DEVICE AND STUB POST AS SHOWN IN THE TABLE.

FOR GUIDE SIGN PLACEMENT AND DETAILS, SEE SIGNING DTL. DWG. NO. 619-08.

FRANGIBLE BOLT BREAKAWAY SYSTEMS APPROVED BY FHWA ARE ALLOWED TO BE USED IN PLACE OF THE DESIGN SHOWN HERE AS AN EQUAL OPTION (PER ENGINEER'S APPROVAL).

PAINT:
EXCEPT AS OTHERWISE APPROVED BY THE ENGINEER, PAINT STRUCTURAL STEEL WITH ONE SHOP COAT AND ONE FIELD COAT OF ZINC RICH BASED PAINT AND ONE FIELD COAT OF ALUMINUM PAINT, AS SPECIFIED IN THE STANDARD SPECIFICATIONS, ON ALL SURFACES NOT IN CONTACT WITH CONCRETE.

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

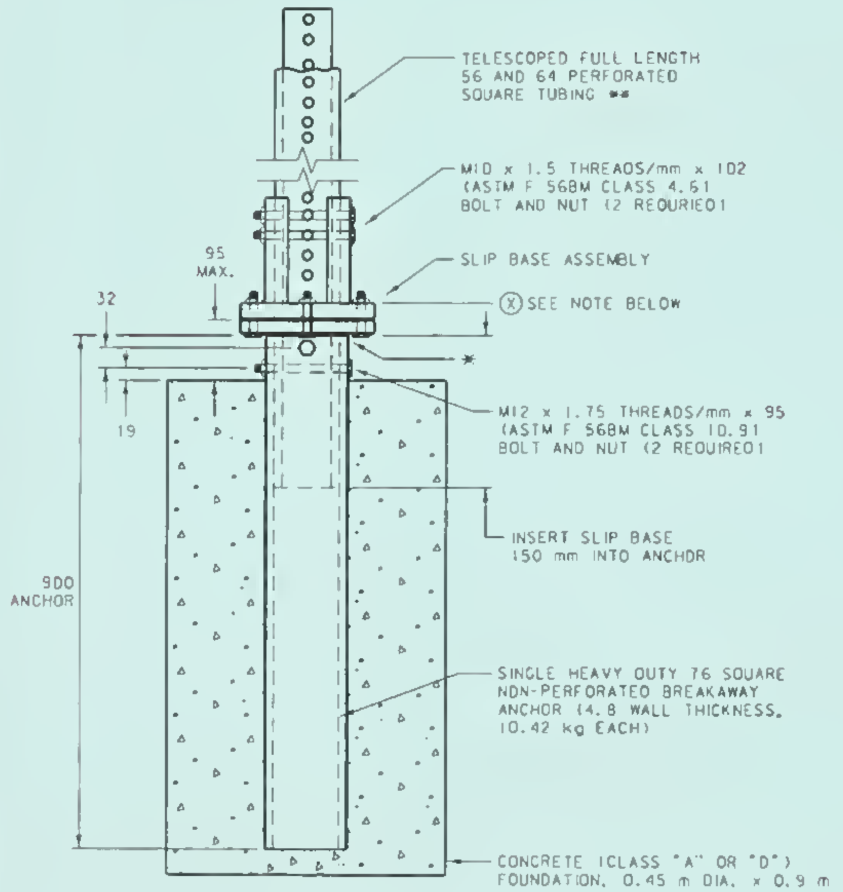
DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 619
DWG. NO.
619-13

BREAKAWAY AND FOUNDATION DETAILS FOR MULTIPLE GUIDE SIGN SUPPORTS

EFFECTIVE: AUGUST 1999
MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

TELESCOPED SQUARE TUBES SIGN POST INSTALLATION ON SLIP BASE

AS NOTED BY THE STAR SYMBOL ★ ON THE LOCATION AND SPECIFICATION SHEETS.

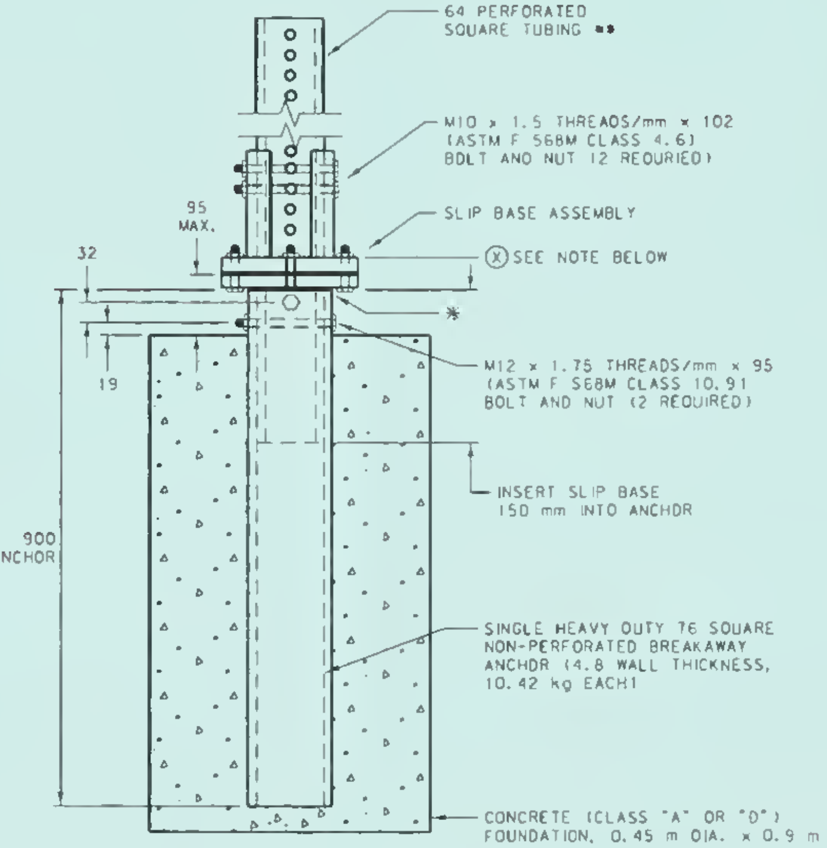

TELESCOPED FULL LENGTH 56 AND 64 PERFORATED SQUARE TUBING **
M10 × 1.5 THREADS/mm × 102 (ASTM F 568M CLASS 4.6) BOLT AND NUT (2 REQUIRED)
95 MAX.
32
SLIP BASE ASSEMBLY
ⓧ SEE NOTE BELOW
*
19
M12 × 1.75 THREADS/mm × 95 (ASTM F 568M CLASS 10.9) BOLT AND NUT (2 REQUIRED)
INSERT SLIP BASE 150 mm INTO ANCHOR
900 ANCHOR
SINGLE HEAVY DUTY 76 SQUARE NON-PERFORATED BREAKAWAY ANCHOR (4.8 WALL THICKNESS, 10.42 kg EACH)
CONCRETE (CLASS "A" OR "D") FOUNDATION, 0.45 m DIA. × 0.9 m

* MINIMUM OF 2 SHIMS REQUIRED PER INSTALLATION TO TAKE UP TOLERANCE BETWEEN SLIP BASE STUB AND FOUNDATION ANCHOR.

** SUPPORT		
TUBE SIZE	WEIGHT	WALL THICKNESS
56	5.13 kg/m	3.4 (10 GAGE)
64	5.66 kg/m	3.4 (10 GAGE)

SINGLE SQUARE TUBE SIGN TO POST INSTALLATION ON SLIP BASE

AS NOTED BY THE CIRCLE SYMBOL ● ON THE LOCATION AND SPECIFICATION SHEETS.

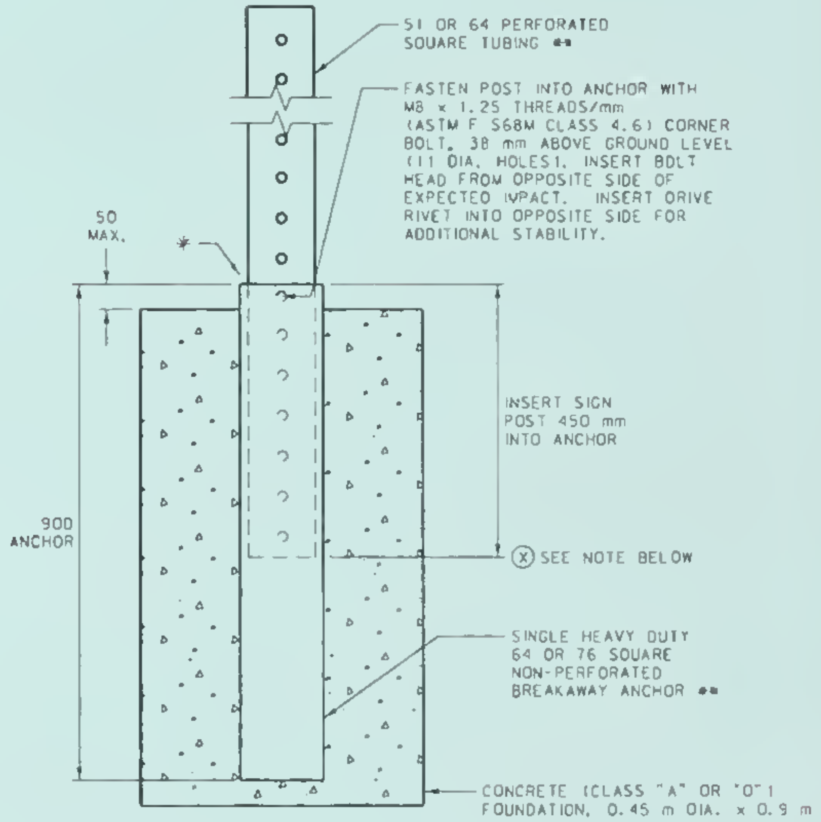

64 PERFORATED SQUARE TUBING **
M10 × 1.5 THREADS/mm × 102 (ASTM F 568M CLASS 4.6) BOLT AND NUT (2 REQUIRED)
95 MAX.
32
SLIP BASE ASSEMBLY
ⓧ SEE NOTE BELOW
*
19
M12 × 1.75 THREADS/mm × 95 (ASTM F 568M CLASS 10.9) BOLT AND NUT (2 REQUIRED)
INSERT SLIP BASE 150 mm INTO ANCHOR
900 ANCHOR
SINGLE HEAVY DUTY 76 SQUARE NON-PERFORATED BREAKAWAY ANCHOR (4.8 WALL THICKNESS, 10.42 kg EACH)
CONCRETE (CLASS "A" OR "D") FOUNDATION, 0.45 m DIA. × 0.9 m

* MINIMUM OF 2 SHIMS REQUIRED PER INSTALLATION TO TAKE UP TOLERANCE BETWEEN SLIP BASE STUB AND FOUNDATION ANCHOR.

** SUPPORT		
TUBE SIZE	WEIGHT	WALL THICKNESS
64	5.66 kg/m	3.4 (10 GAGE)

SINGLE SQUARE TUBE SIGN POST INSTALLATION

AS NOTED BY THE TRIANGLE SYMBOL ▲ ON THE LOCATION AND SPECIFICATION SHEETS.


51 OR 64 PERFORATED SQUARE TUBING **
FASTEN POST INTO ANCHOR WITH M8 × 1.25 THREADS/mm (ASTM F 568M CLASS 4.6) CORNER BOLT, 38 mm ABOVE GROUND LEVEL (11 DIA. HOLES). INSERT BOLT HEAD FROM OPPOSITE SIDE OF EXPECTED IMPACT. INSERT DRIVE RIVET INTO OPPOSITE SIDE FOR ADDITIONAL STABILITY.
50 MAX.
*
INSERT SIGN POST 450 mm INTO ANCHOR
900 ANCHOR
ⓧ SEE NOTE BELOW
SINGLE HEAVY DUTY 64 OR 76 SQUARE NON-PERFORATED BREAKAWAY ANCHOR **
CONCRETE (CLASS "A" OR "D") FOUNDATION, 0.45 m DIA. × 0.9 m

* MINIMUM OF 2 SHIMS REQUIRED PER INSTALLATION TO TAKE UP TOLERANCE BETWEEN SUPPORT AND ANCHOR.

** SUPPORT AND CORRESPONDING ANCHOR					
SUPPORT			ANCHOR		
TUBE SIZE	WEIGHT	WALL THICKNESS	TUBE SIZE	WEIGHT	WALL THICKNESS
51	3.60 kg/m	2.7 (12 GAGE)	64	8.33 kg EACH	3.4
64	5.66 kg/m	3.4 (10 GAGE)	76	10.43 kg EACH	4.8

NOTES:

ALTERNATE CRASH TESTED AND APPROVED BREAKAWAY DEVICES MAY BE USED AS AN OPTION WITH PRIOR APPROVAL OF THE MDT. CONTACT TRAFFIC ENGINEERING FOR INFORMATION.

USE CONCRETE CLASS "A" OR "D" WITH WOOD FLOAT FINISH ON TOP. FORM TOP 150 mm OF FOUNDATION.

GALVANIZE PIPE PER AASHTO M 111.

PAINT PIPE WITH ONE SHOP COAT AND ONE FIELD COAT OF ZINC RICH BASED PAINT AND ONE FIELD COAT OF ALUMINUM PAINT, AS SPECIFIED IN THE STANDARD SPECIFICATIONS SECTION 710. ON ALL SURFACES NOT IN CONTACT WITH THE CONCRETE.

CONFORM STEEL PIPE TO THE REQUIREMENTS OF ASTM A 53 TYPE E OR S, GRADE B.

SUBMIT SHOP DRAWINGS TO BE APPROVED BY THE MONTANA DEPARTMENT OF TRANSPORTATION BEFORE FABRICATION IS BEGUN.

ⓧ BASE POINT OF POST LENGTH MEASUREMENT. TYPE OF POSTS AND FOUNDATIONS, AS WELL AS LENGTHS ARE NOTED IN THE SIGNING QUANTITIES.

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING

REFERENCE	DWG. NO.
STANDARD SPEC. SECTION 556, 619, 704	619-14

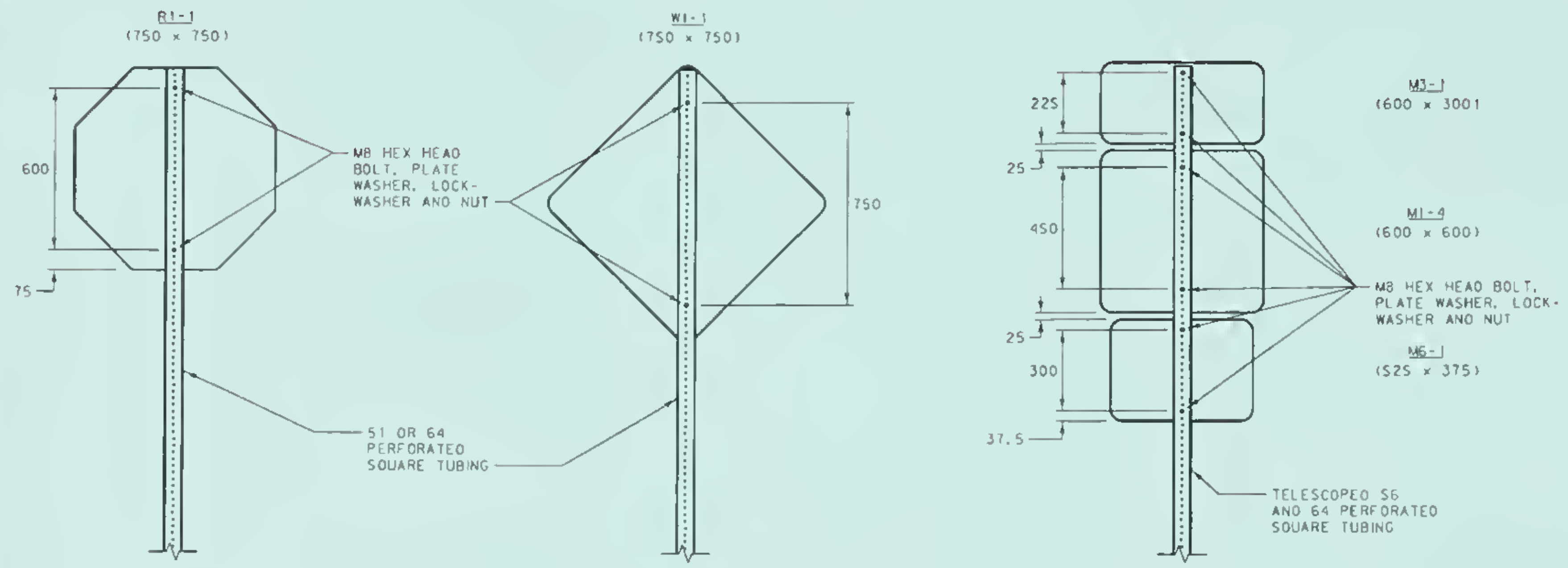
SIGN POST
BREAKAWAY DEVICES

EFFECTIVE: AUGUST 1999

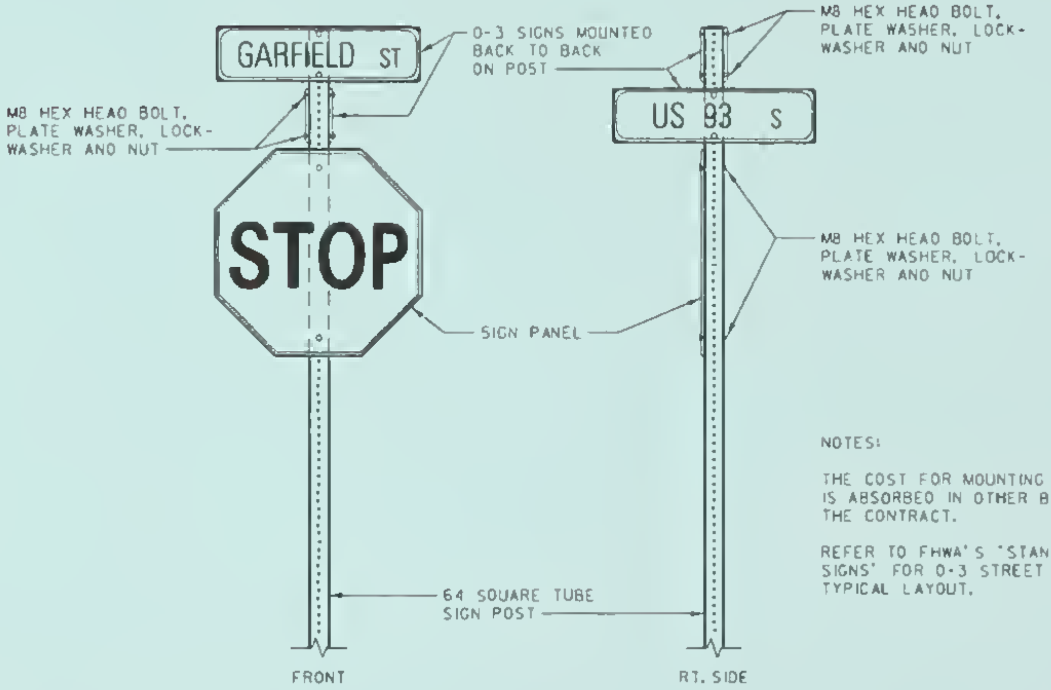
MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

SIGNS WITHOUT BACKBRACING

(SEE PLANS FOR BACKBRACING REQUIREMENTS)


R1-1
(750 x 750)
600
75
M8 HEX HEAD BOLT, PLATE WASHER, LOCK-WASHER AND NUT
51 OR 64 PERFORATED SQUARE TUBING
W1-1
(750 x 750)
750
225
25
450
25
300
37.5
M3-1
(600 x 300)
M1-4
(600 x 600)
M8 HEX HEAD BOLT, PLATE WASHER, LOCK-WASHER AND NUT
M6-1
(525 x 375)
TELESCOPED 56 AND 64 PERFORATED SQUARE TUBING

STREET NAME SIGN INSTALLATION


GARFIELD ST
D-3 SIGNS MOUNTED BACK TO BACK ON POST
M8 HEX HEAD BOLT, PLATE WASHER, LOCK-WASHER AND NUT
STOP
US 93 S
M8 HEX HEAD BOLT, PLATE WASHER, LOCK-WASHER AND NUT
M8 HEX HEAD BOLT, PLATE WASHER, LOCK-WASHER AND NUT
SIGN PANEL
64 SQUARE TUBE SIGN POST
FRONT
RT. SIDE

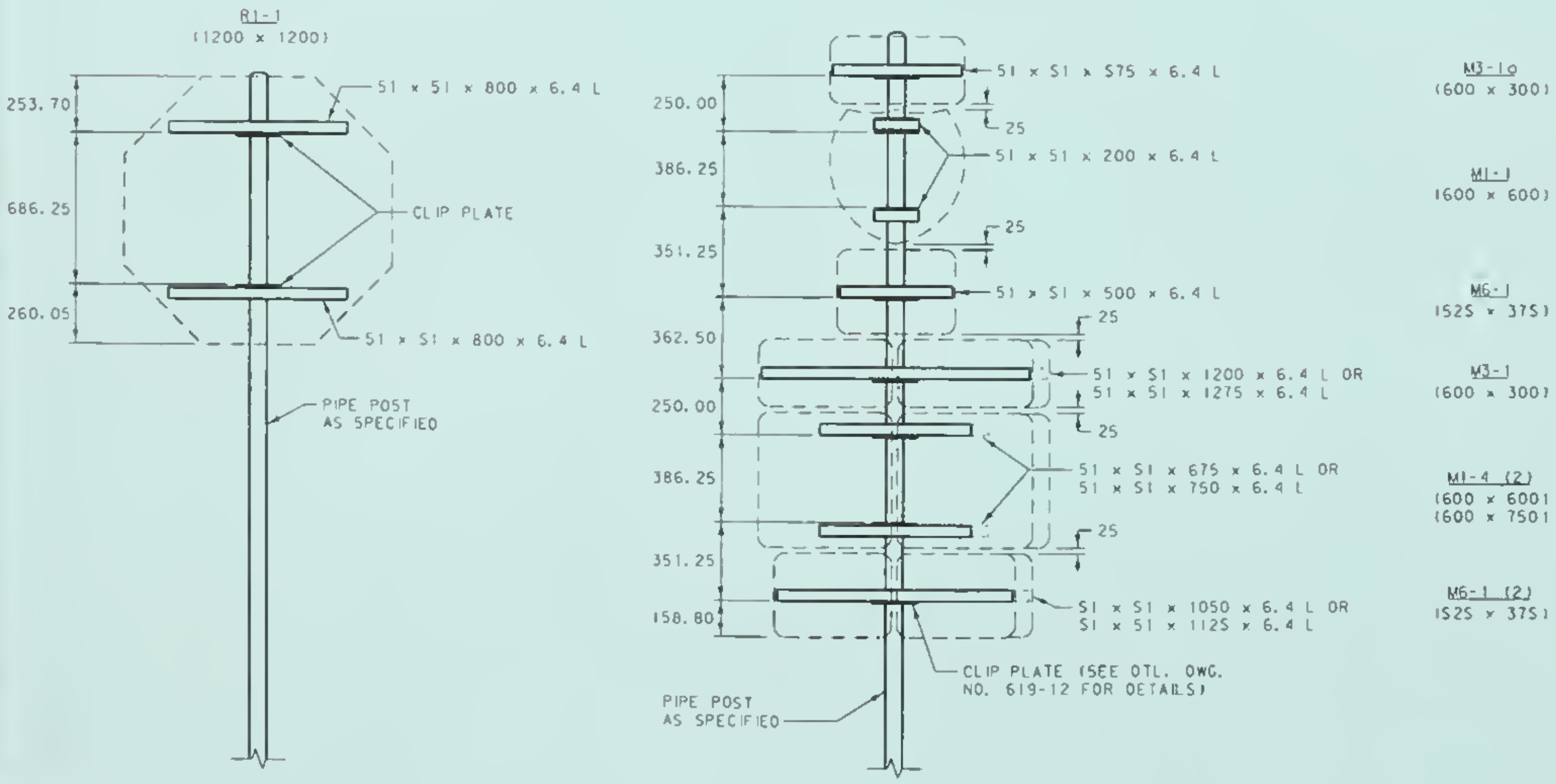
NOTES:

THE COST FOR MOUNTING D-3 SIGNS IS ABSORBED IN OTHER BID ITEMS OF THE CONTRACT.

REFER TO FHWA'S "STANDARD HIGHWAY SIGNS" FOR D-3 STREET NAME SIGN TYPICAL LAYOUT.

SIGNS WITH BACKBRACING

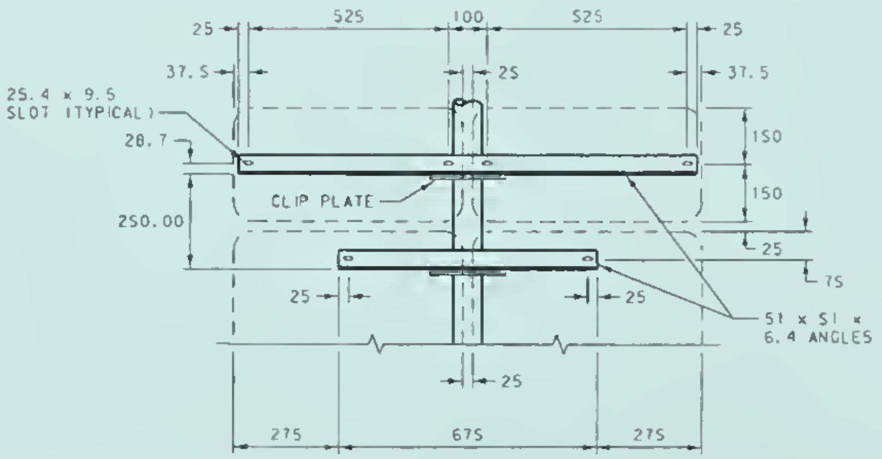
(SEE PLANS FOR BACKBRACING REQUIREMENTS)



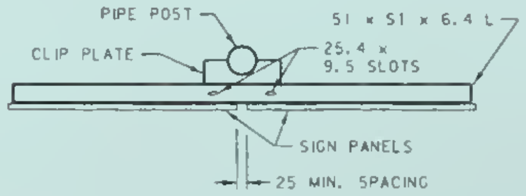
TYPICAL MOUNTING DETAILS

(FOR 75 mm DIA. AND LARGER PIPE)

ELEVATION



PLAN VIEW



NOTES:

VERTICAL DIMENSIONS SHOWN ARE FROM TOP TO TOP OF ALL POST CLIP PLATES.

PLACE A SUITABLE WATERTIGHT CAP ON TOP OF ALL PIPE POSTS.

BREAKAWAY DEVICES FOR SQUARE TUBING ARE SHOWN ON DTL. DWG. NO. 619-14.

CONFORM MATERIAL USED IN FABRICATION OF POST CLIPS AND ANGLE BRACKETS TO SECTION 556 OF THE STANDARD SPECIFICATIONS.

THE LENGTH OF EACH ANGLE BRACKET DEPENDS ON THE MOUNTING ASSEMBLY AND HOLE SPACING OF EACH SIGN. THE ASSEMBLIES SHOWN ARE TYPICAL INSTALLATIONS. ERECT SIMILAR ASSEMBLIES IN A LIKE MANNER.

REFER TO FHWA'S "STANDARD HIGHWAY SIGNS" FOR STANDARD HOLE SPACING IN SIGNS.

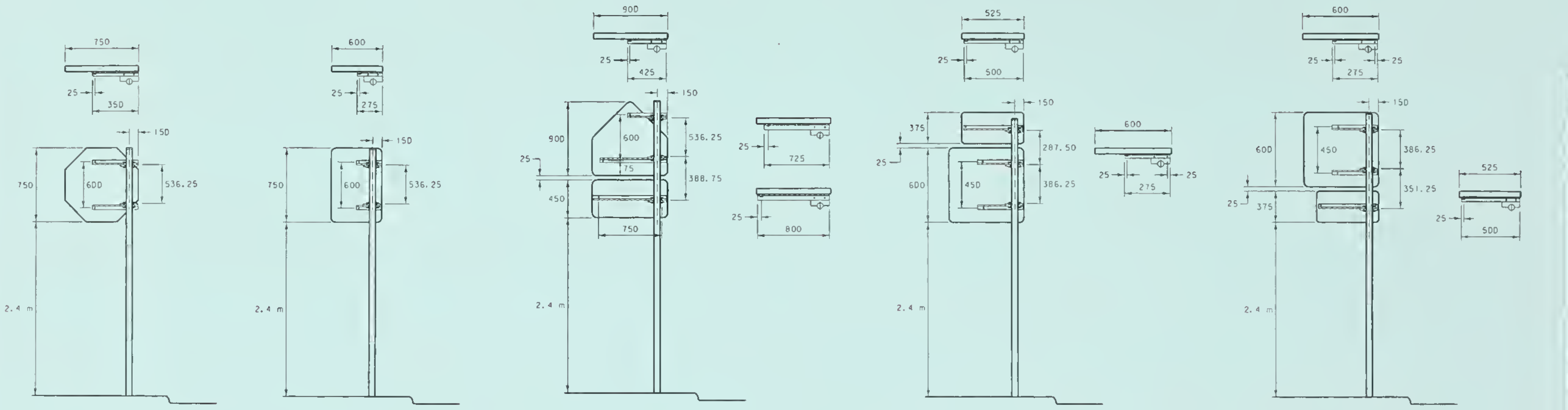
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

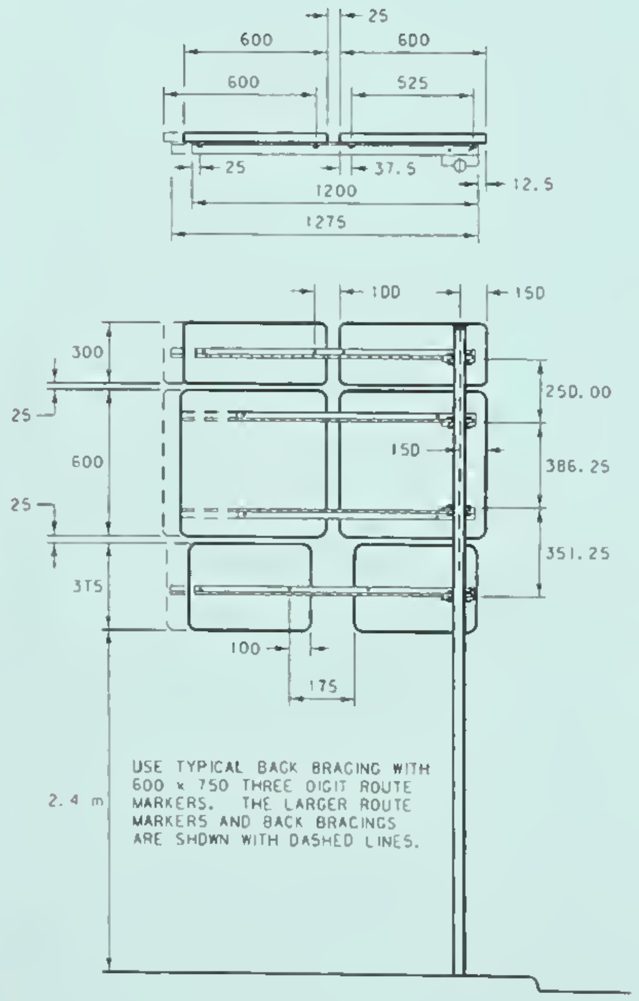
DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 556, 619, 704
DWG. NO.
619-16

TYPICAL STEEL POST
MOUNTING DETAILS

EFFECTIVE: AUGUST 1999

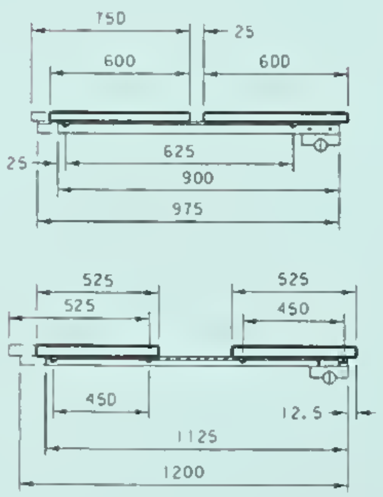
MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

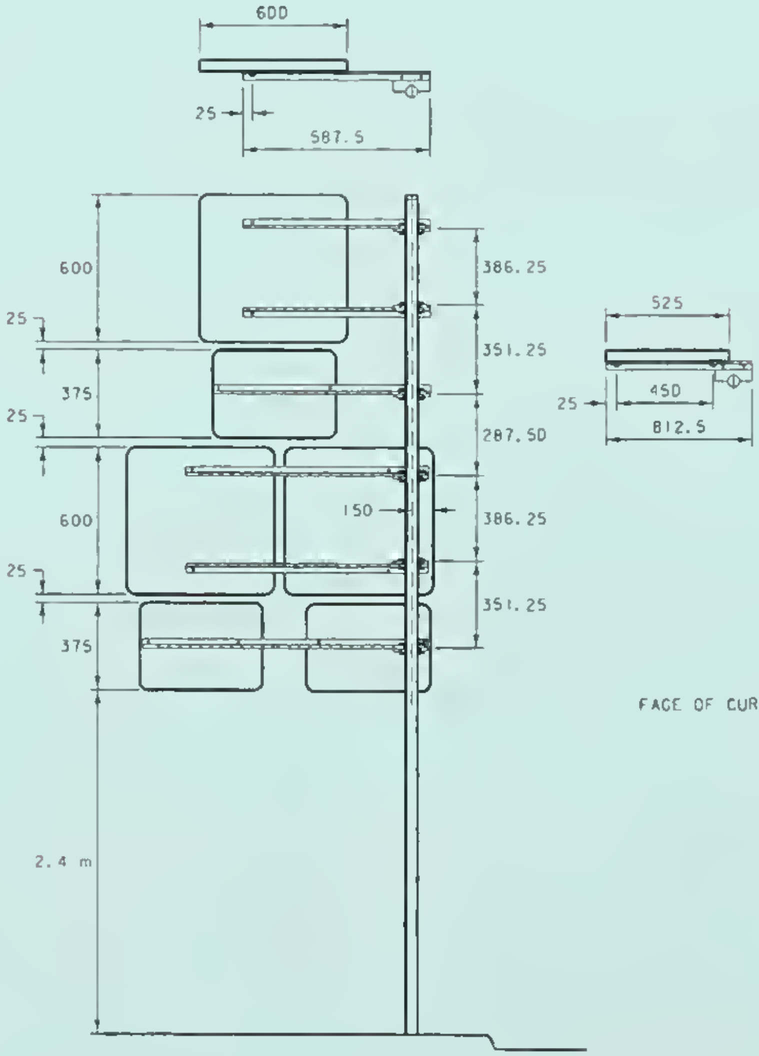




USE TYPICAL BACK BRACING WITH 600 × 750 THREE DIGIT ROUTE MARKERS. THE LARGER ROUTE MARKERS AND BACK BRACINGS ARE SHOWN WITH DASHED LINES.

NOTE:
ALTERNATE MOUNTING MUST BE APPROVED BY THE ENGINEER.





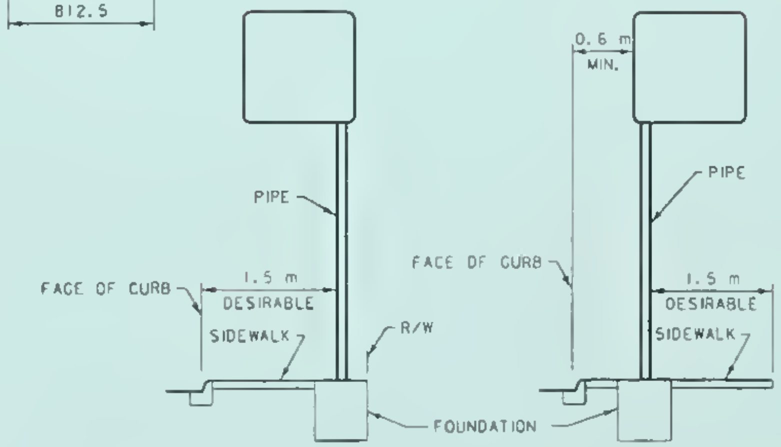
NOTES:

REFER TO FHWA'S MANUAL "STANDARD HIGHWAY SIGNS" FOR STANDARD HOLE SPACING IN SIGNS.

USE POST CLIPS AS SHOWN IN SIGNING DETAILED DRAWING NO. 619-12 WHEN CANTILEVER MOUNTING IS NECESSARY.

USE POSTS ONE SIZE LARGER THAN THOSE REQUIRED FOR STANDARD MOUNTINGS.

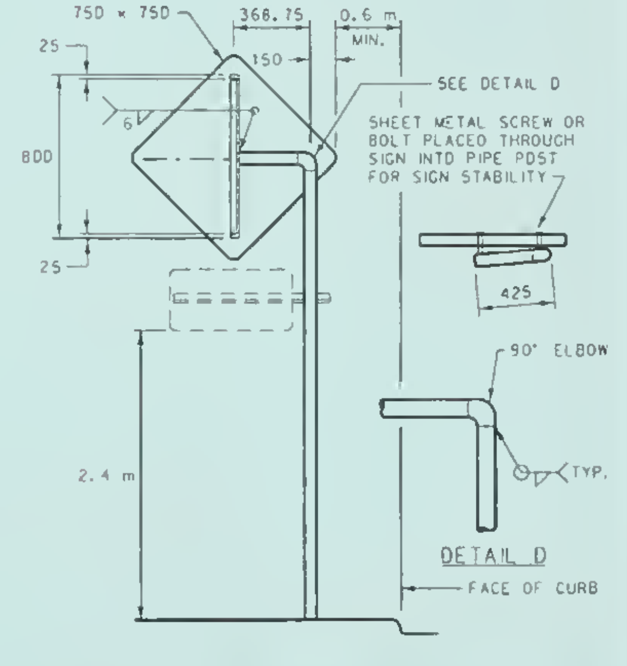
DIMENSIONS FOR POST CLIP SPACING ARE SHOWN TO THE TOP OF EACH CLIP.



ALTERNATE A

ALTERNATE B

USE THE STANDARD TYPE MOUNTING BEHIND SIDEWALKS IF R/W LIMITS PERMIT. IF R/W DOES NOT PERMIT, THEN ALTERNATE A SHOULD BE USED BEHIND SIDEWALKS OR IN THE SIDEWALK NEXT TO A BUILDING. IF CONDITIONS ARE SUCH THAT THE SIGN CANNOT BE MOUNTED ON THE BACKSIDE OF THE SIDEWALK THEN USE ALTERNATE B.



DETAIL C

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 556, 619, 704
DWG. NO.
619-18

CANTILEVER TYPE SIGN
SUPPORT DETAILS
FOR SIDEWALK AREAS

EFFECTIVE: AUGUST 1999
MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

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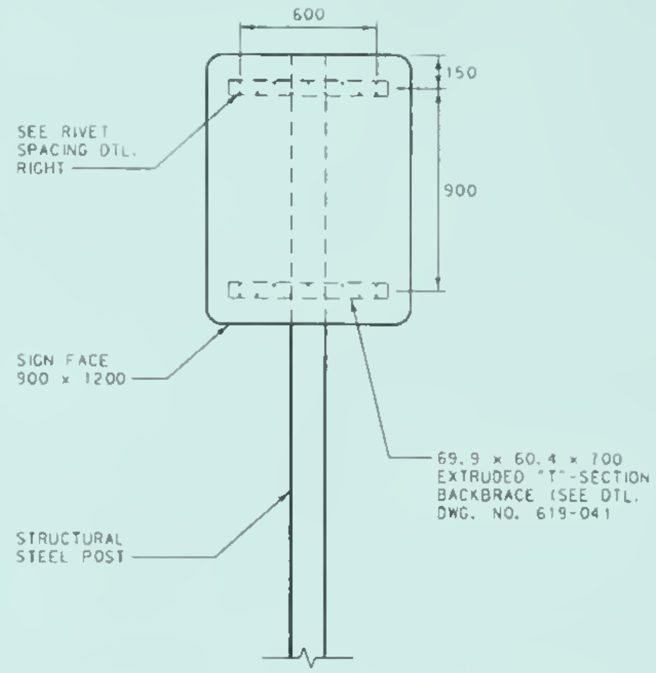
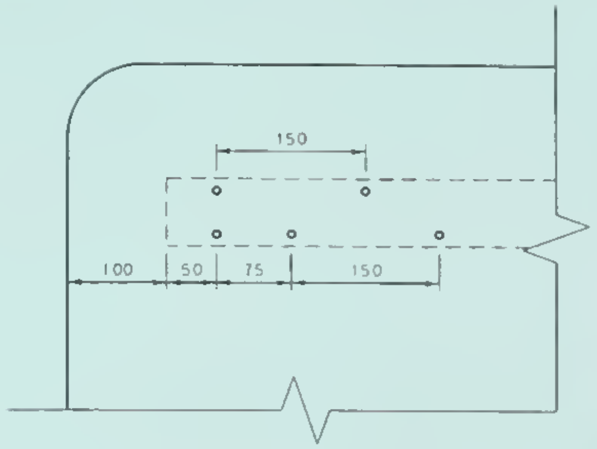
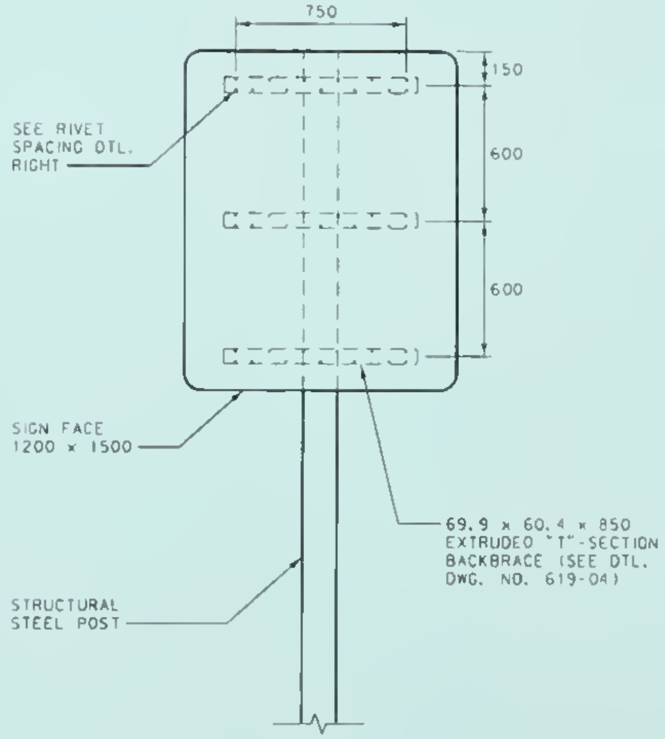
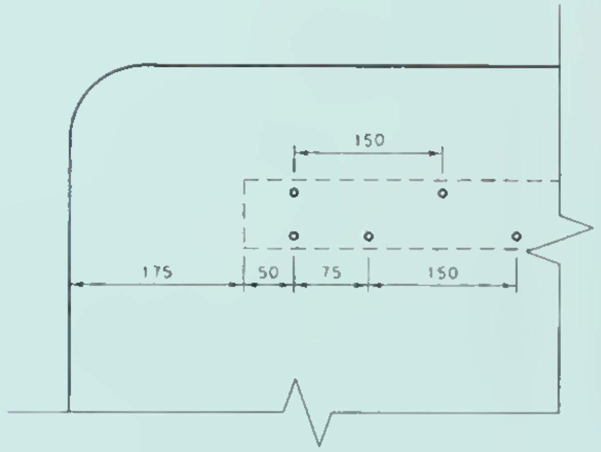

600
150
900
SEE RIVET SPACING DTL. RIGHT
SIGN FACE 900 × 1200
69.9 × 60.4 × 700 EXTRUDED "T"-SECTION BACKBRACE (SEE DTL. DWG. NO. 619-04)
STRUCTURAL STEEL POST



RIVET SPACING


750
150
600
600
SEE RIVET SPACING DTL. RIGHT
SIGN FACE 1200 × 1500
69.9 × 60.4 × 850 EXTRUDED "T"-SECTION BACKBRACE (SEE DTL. DWG. NO. 619-04)
STRUCTURAL STEEL POST



RIVET SPACING

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

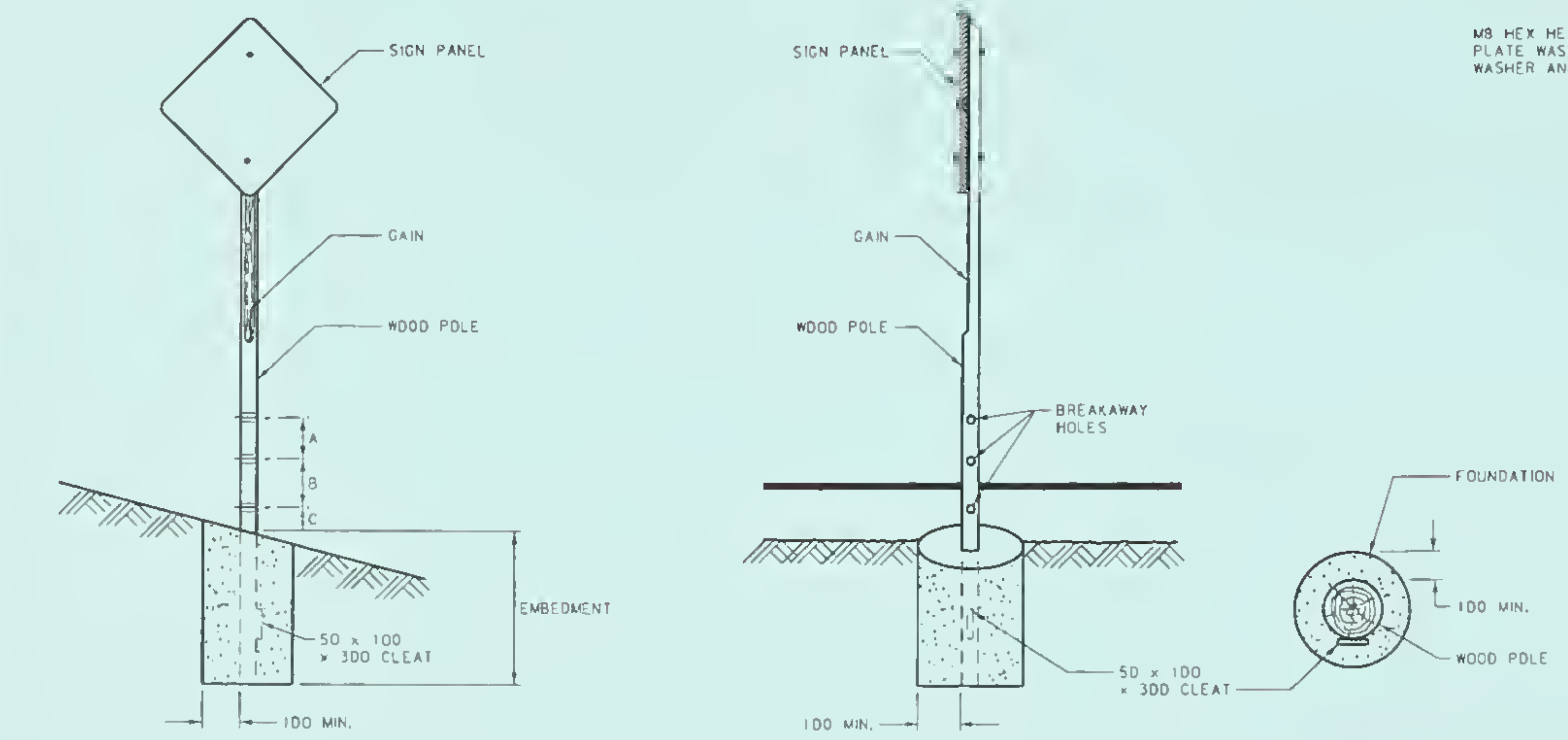
NOTE:
SEE THE PLANS
FOR BACKBRACING
REQUIREMENTS.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 619.704
DWG. NO.
619-19

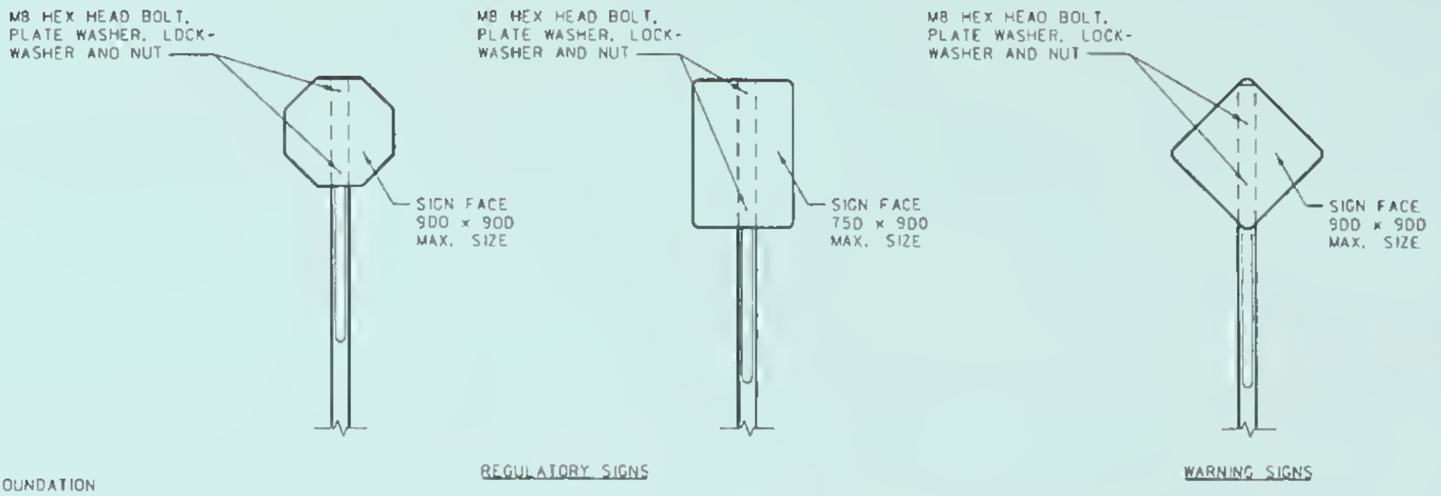
STRUCTURAL
STEEL POST
SIGN MOUNTING DETAILS

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



BREAKAWAY AND FOOTING DETAILS

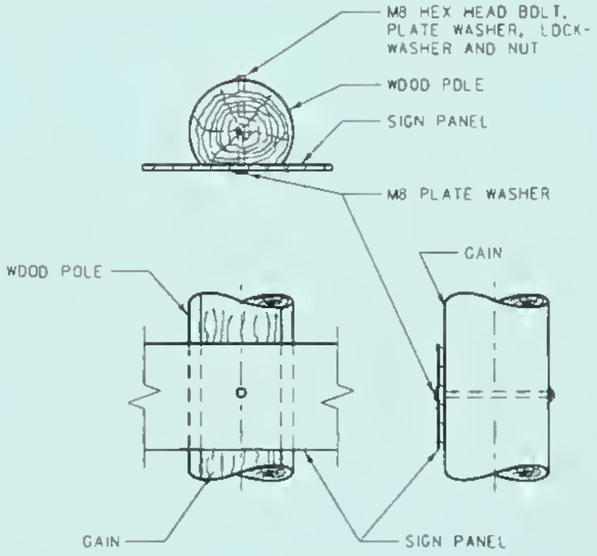

M8 HEX HEAD BOLT, PLATE WASHER, LOCK-WASHER AND NUT
SIGN FACE 900 x 900 MAX. SIZE
M8 HEX HEAD BOLT, PLATE WASHER, LOCK-WASHER AND NUT
SIGN FACE 750 x 900 MAX. SIZE
M8 HEX HEAD BOLT, PLATE WASHER, LOCK-WASHER AND NUT
SIGN FACE 900 x 900 MAX. SIZE

REGULATORY SIGNS

WARNING SIGNS

TYPICAL SIGN MOUNTINGS

(NO BACKBRACING)



SIGN MOUNTING DETAIL

NOTES:

CONFORM ALL WOOD POLES TO THE REQUIREMENTS OF SECTION 704 OF THE STANDARD SPECIFICATIONS.

GAIN ALL POLES ON THE SIGN SIDE THE MINIMUM WIDTH SHOWN IN THE TABLE, FOR HALF THE LENGTH OF EACH POLE.

BREAKAWAY DETAILS ARE STANDARD FOR ALL WOOD POLES LISTED IN THE TABLE, ON SINGLE AND MULTIPLE SIGN SUPPORTS.

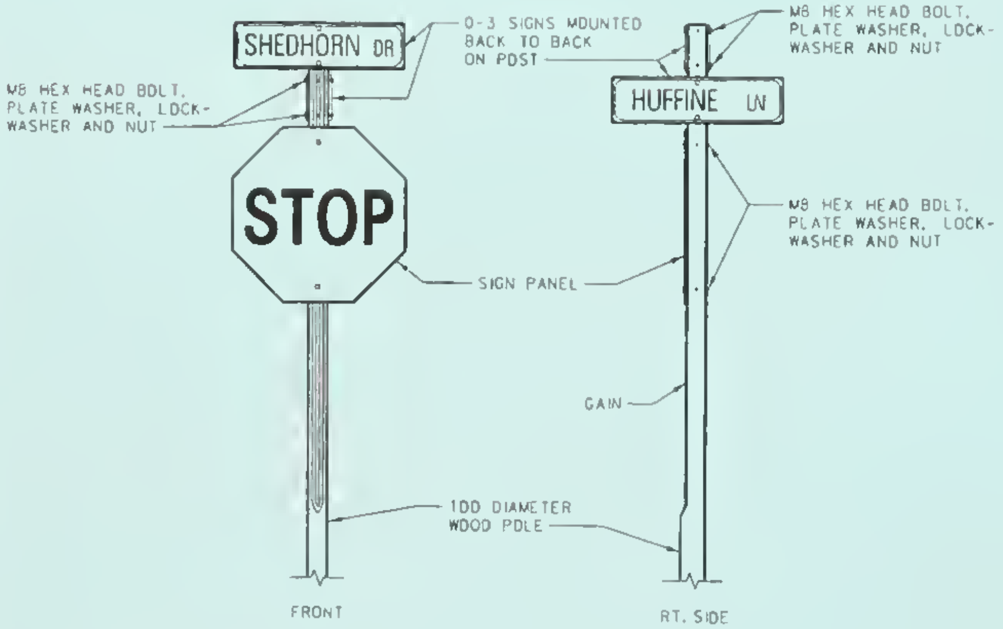
ALL BOLTS, NUTS AND WASHERS MUST CONSIST OF ALUMINUM, STAINLESS STEEL OR CADMIUM PLATED STEEL MATERIAL.

ATTACH A 50 mm x 100 mm x 300 mm BOARD 300 mm FROM THE BOTTOM OF THE POLE TO PREVENT SPINNING. ATTACH THIS CLEAT BY DRIVING TWO 16d NAILS THROUGH THE CLEAT AND INTO THE POLE. TREAT THE 50 mm x 100 mm CLEAT ACCORDING TO THE STANDARD SPECIFICATIONS.

⊗ THE MAXIMUM CROSS-SECTIONAL AREA AT A POINT 100 mm ABOVE GROUND LEVEL MAY NOT EXCEED 15 480 SQUARE MILLIMETERS EXCLUSIVE OF DRILLED BREAKAWAY HOLES FOR UNPROTECTED POST INSTALLATIONS. THE HOLE DIAMETER MAY BE ENLARGED IF NECESSARY TO INSURE THIS REQUIREMENT IS MET.

USE SOIL CEMENT FOR THE FOUNDATION - SEE SECTION 619.03.3 OF THE STANDARD SPECIFICATIONS.

FOR SIGNS REQUIRING BACKBRACING, CONSULT DTL. DWG. NO. 619-21 AND 619-22 FOR BACKBRACING OPTIONS AND DETAILS.

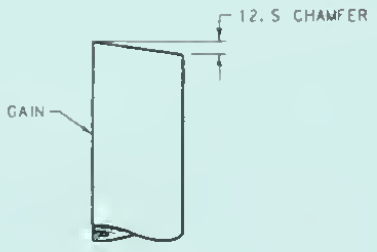

SHEDHORN DR
D-3 SIGNS MOUNTED BACK TO BACK ON POST
M8 HEX HEAD BOLT, PLATE WASHER, LOCK-WASHER AND NUT
STOP
SIGN PANEL
100 DIAMETER WOOD POLE
FRONT
M8 HEX HEAD BOLT, PLATE WASHER, LOCK-WASHER AND NUT
HUFFINE LN
M8 HEX HEAD BOLT, PLATE WASHER, LOCK-WASHER AND NUT
GAIN
RT. SIDE

NOTES:

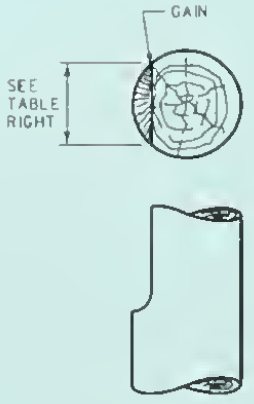
THE COST FOR MOUNTING D-3 SIGNS IS ABSORBED IN OTHER BID ITEMS OF THE CONTRACT.

REFER TO FHWA'S "STANDARD HIGHWAY SIGNS" FOR D-3 STREET NAME SIGN TYPICAL LAYOUT.

STREET NAME SIGN INSTALLATION



TOP END TREATMENT



GAIN DETAIL

MUST BE PROTECTED OR OUT OF CLEAR ZONE (150 TOP DIA. through CLASS 1)

POLE SIZE	A	B	C	HOLE DIA. (SEE NOTE ⊗)	EMBEDMENT	GAIN
75 TOP DIA.	~	~	~	~	0.9 m	70
100 TOP DIA.	~	~	~	~	0.9 m	90
130 TOP DIA.	~	300	100	51	1.1 m	100
150 TOP DIA.	~	300	100	64	1.4 m	100
CLASS 4	~	300	100	51	1.5 m	100
CLASS 3	~	300	100	64	1.7 m	100
CLASS 2	150	150	100	51	1.8 m	100
CLASS 1	150	150	100	64	2.0 m	100

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING

REFERENCE
STANDARD SPEC.
SECTION 619.704

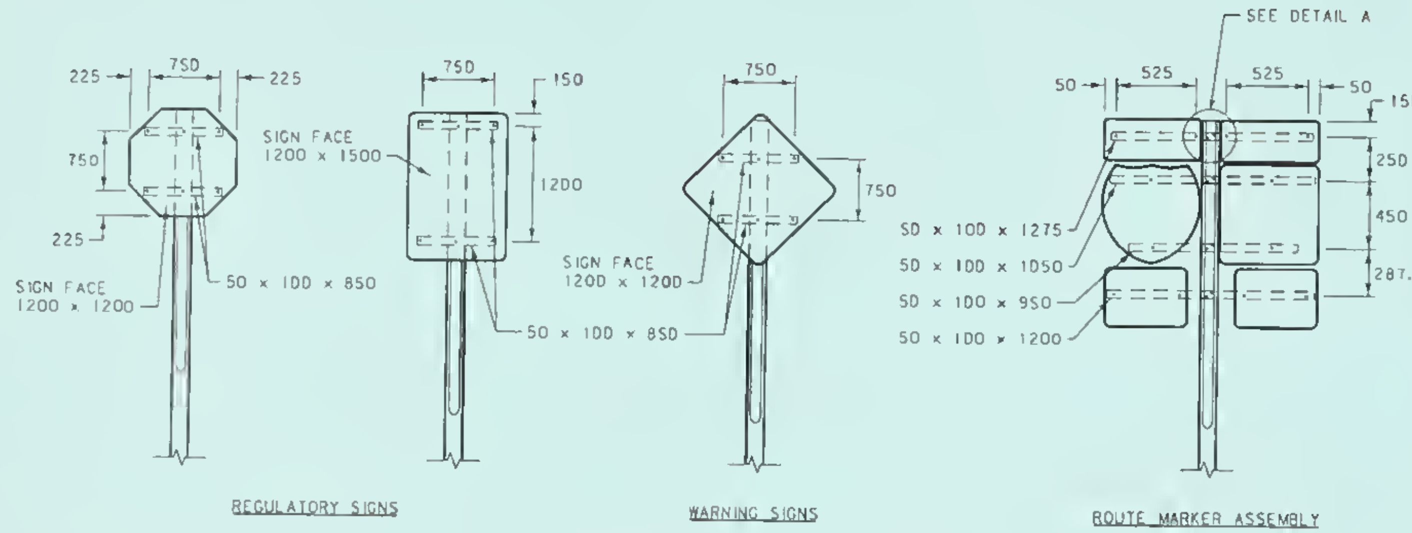
DWG. NO.
619-20

TREATED WOOD POLE
SIGN MOUNTING AND
SUPPORT DETAILS

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION

MONTANA CADD



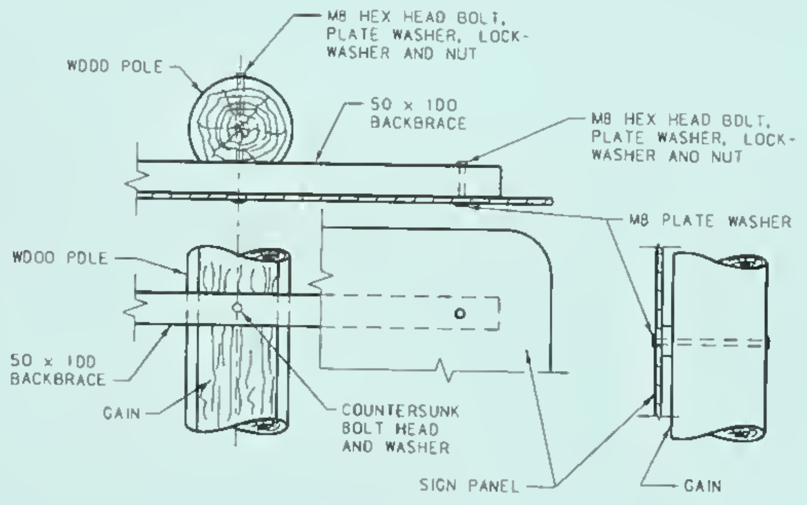
REGULATORY SIGNS   WARNING SIGNS   ROUTE MARKER ASSEMBLY

NOTE:

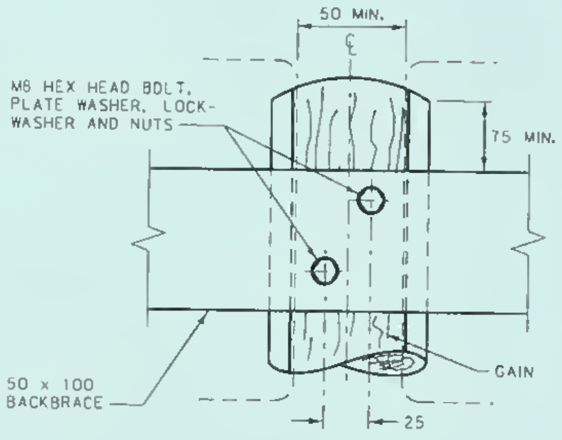
SIGNS OF THESE SIZES AND LARGER REQUIRE WOOD BACKBRACING.

SMALLER SIGNS MAY REQUIRE BACKBRACING IF THE CONDITIONS WARRANT (SEE SIGNING PLANS). IN THIS CASE, THE CONTRACTOR HAS THE OPTION OF USING WOOD OR STEEL BACKBRACING (SEE DTL. DWG. NO. 619-22).

WOOD BACKBRACE INSTALLATIONS


WOOD POLE
M8 HEX HEAD BOLT, PLATE WASHER, LOCK-WASHER AND NUT
50 x 100 BACKBRACE
M8 HEX HEAD BOLT, PLATE WASHER, LOCK-WASHER AND NUT
M8 PLATE WASHER
WOOD POLE
50 x 100 BACKBRACE
GAIN
COUNTERSUNK BOLT HEAD AND WASHER
SIGN PANEL
GAIN

SIGN MOUNTING DETAIL



DETAIL A
(BACKBRACE)

NOTES:

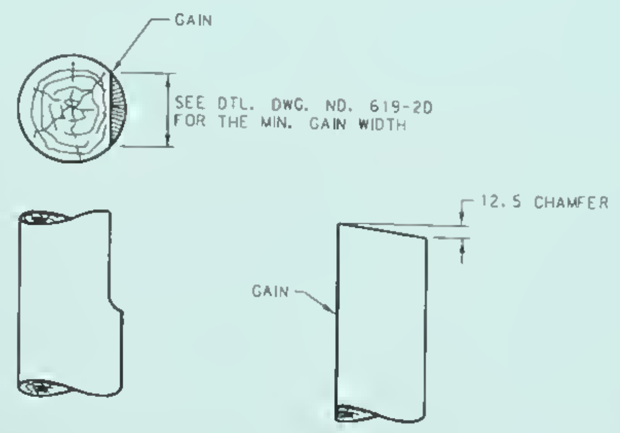
CONFORM ALL WOOD POLES TO THE REQUIREMENTS OF SECTION 704 OF THE STANDARD SPECIFICATIONS.

GAIN ALL POLES ON THE SIGN SIDE THE MINIMUM WIDTH SHOWN IN THE TABLE ON DTL. DWG. NO. 619-20, FOR HALF THE LENGTH OF EACH POLE.

USE 50 mm x 100 mm S4S LUMBER FOR ALL WOOD BACK-BRACING, CONFORMING TO THE REQUIREMENTS OF SECTION 704 OF THE STANDARD SPECIFICATIONS.

ALL BOLTS, NUTS AND WASHERS MUST CONSIST OF ALUMINUM, STAINLESS STEEL OR CADMIUM PLATED STEEL MATERIAL.

SEE DTL. DWG. NO. 619-20 FOR BREAKAWAY AND SUPPORT DETAILS.



GAIN DETAIL   TOP END TREATMENT

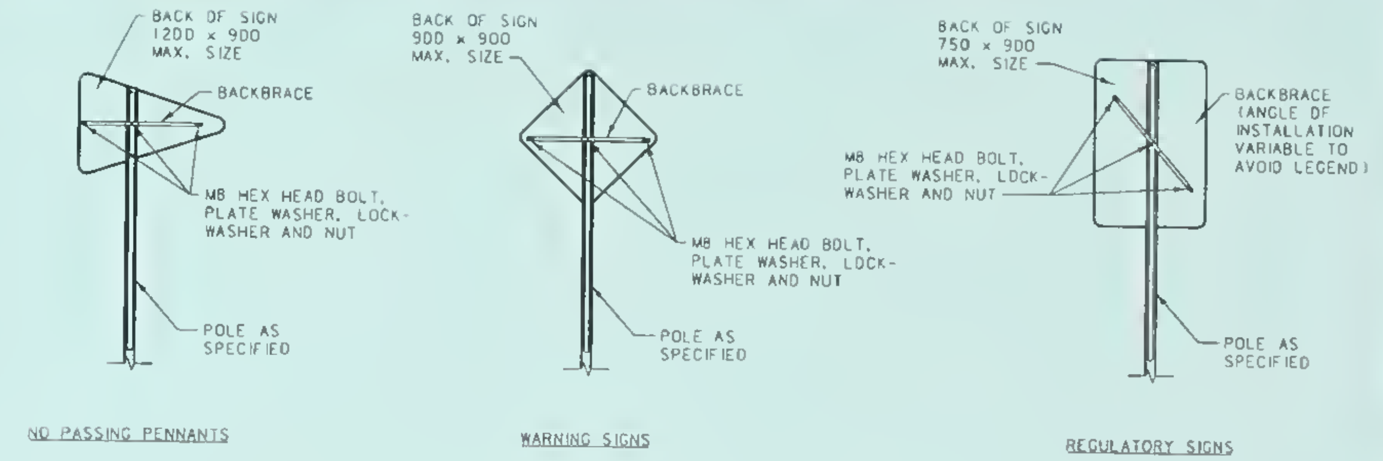
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE   DWG. NO.
STANDARD SPEC.
SECTION 619, 704   619-21

TREATED WOOD POLE
SIGN MOUNTING DETAILS

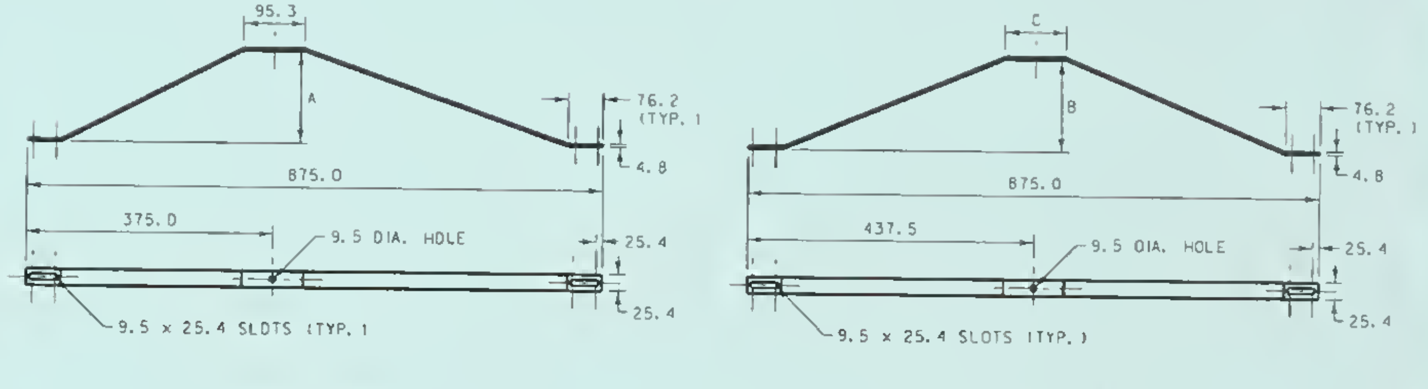
EFFECTIVE: AUGUST 1999

MDT *MONTANA DEPARTMENT OF TRANSPORTATION*   MONTANA CADD


BACK OF SIGN 1200 x 900 MAX. SIZE
BACKBRACE
M8 HEX HEAD BOLT, PLATE WASHER, LOCK-WASHER AND NUT
POLE AS SPECIFIED
BACK OF SIGN 900 x 900 MAX. SIZE
BACKBRACE
M8 HEX HEAD BOLT, PLATE WASHER, LOCK-WASHER AND NUT
POLE AS SPECIFIED
BACK OF SIGN 750 x 900 MAX. SIZE
BACKBRACE (ANGLE OF INSTALLATION VARIABLE TO AVOID LEGEND)
M8 HEX HEAD BOLT, PLATE WASHER, LOCK-WASHER AND NUT
POLE AS SPECIFIED

NO PASSING PENNANTS   WARNING SIGNS   REGULATORY SIGNS

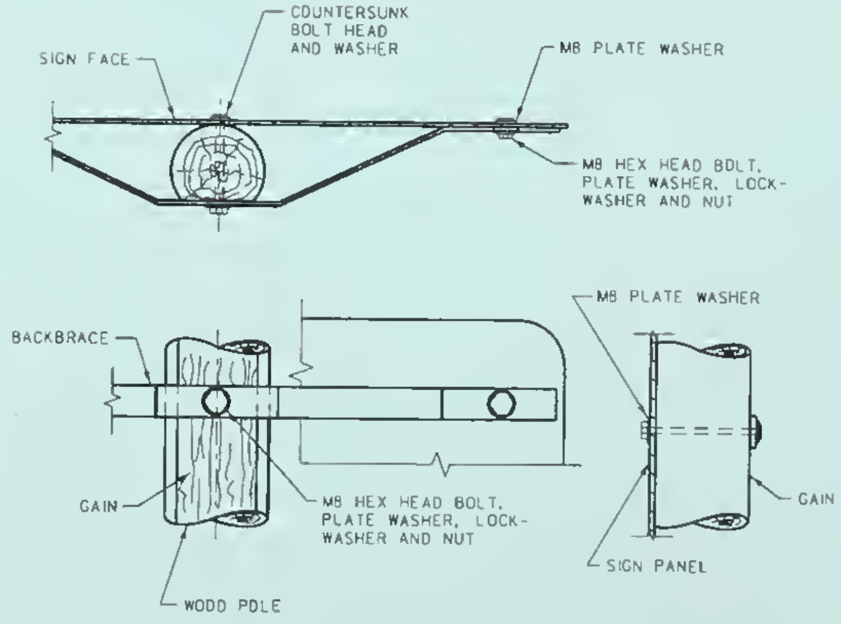
STEEL BACKBRACE INSTALLATIONS



NO PASSING PENNANTS   REGULATORY AND WARNING SIGNS

STEEL BACKBRACE DETAILS

POLE DIA.	A	B	C
75	54.0	54.0	95.3
100	76.2	76.2	95.3
130	-	101.6	108.0
150	-	133.4	108.0


COUNTERSUNK BOLT HEAD AND WASHER
SIGN FACE
M8 PLATE WASHER
M8 HEX HEAD BOLT, PLATE WASHER, LOCK-WASHER AND NUT
M8 PLATE WASHER
BACKBRACE
GAIN
M8 HEX HEAD BOLT, PLATE WASHER, LOCK-WASHER AND NUT
GAIN
SIGN PANEL
WOOD POLE

SIGN MOUNTING DETAIL

NOTES:

USE COMMERCIAL QUALITY, MILD STEEL, HOT-DIPPED AFTER FABRICATION. GALVANIZE ACCORDING TO THE SPECIFICATIONS OF AASHTO M 111.

SEE DTL. DWG. NO. 619-21 FOR APPLICATIONS OF THIS TYPE OF BRACE AND ADDITIONAL SIGN MOUNTING REQUIREMENTS.

SEE DTL. DWG. NO. 619-20 FOR BREAKAWAY AND SUPPORT DETAILS.

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE   DWG. NO.
STANDARD SPEC.
SECTION 619   619-22

TREATED WOOD POLE
OPTIONAL BACKBRACE

EFFECTIVE: AUGUST 1999

MDT *MONTANA DEPARTMENT OF TRANSPORTATION*   MONTANA CADD

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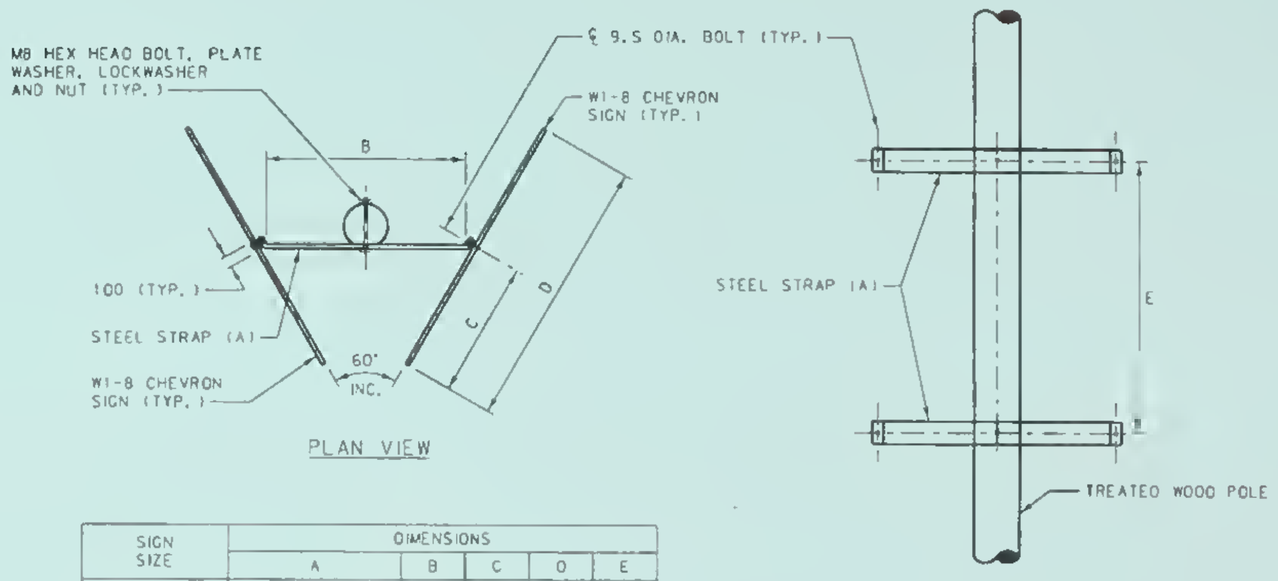


PLAN VIEW

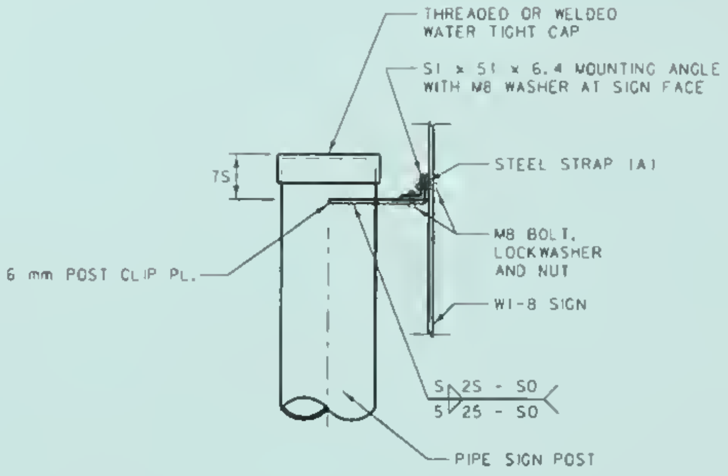
ELEVATION

SIGN SIZE	DIMENSIONS				
	A	B	C	D	E
450 × 600	6 × 50 × 580	380	225	450	450
600 × 750	6 × 50 × 655	455	300	600	600
750 × 900	6 × 50 × 735	535	375	750	750
900 × 1200	6 × 50 × 810	610	450	900	900

WOOD POST MOUNTING

MOUNT 2 CHEVRON SIGNS ON EACH POST WITH EACH PANEL ADJUSTED TO APPROXIMATE RIGHT ANGLE TO ROADWAY CENTERLINE. EXACT LOCATION AND ANGLE TO BE DETERMINED BY ENGINEER.

W1-8 CHEVRON ALIGNMENT SIGNS MAY BE USED AS AN ALTERNATE OR AS A SUPPLEMENT TO DELINEATION TO PROVIDE ADDITIONAL EMPHASIS AND GUIDANCE WHEN A CHANGE IN HORIZONTAL ALIGNMENT EXISTS IN THE ROADWAY.


THREADED OR WELDED WATER TIGHT CAP
51 × 51 × 6.4 MOUNTING ANGLE WITH M8 WASHER AT SIGN FACE
STEEL STRAP (A)
75
M8 BOLT, LOCKWASHER AND NUT
6 mm POST CLIP PL.
W1-8 SIGN
5 25 - 50
5 25 - 50
PIPE SIGN POST

STEEL PIPE MOUNTING

NOTES:

INSTALL CHEVRONS WITH A MINIMUM 3.1 m HORIZONTAL CLEARANCE AND A 1.5 m VERTICAL MOUNTING HEIGHT.

SPACING FOR DESIGN PURPOSES IS DOUBLE THE SPACING SHOWN IN THE TABLE ON DTL. DWG. NO. 619-36, UP TO A MAXIMUM CHEVRON SPACING OF 60 m. A MINIMUM OF 3 VISIBLE CHEVRONS ARE REQUIRED THROUGH A CURVE.

FIELD INSPECT THE CHEVRONS AT NIGHT AND ADJUST THEIR LOCATIONS TO ACHIEVE 150 m OF VISIBILITY.

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

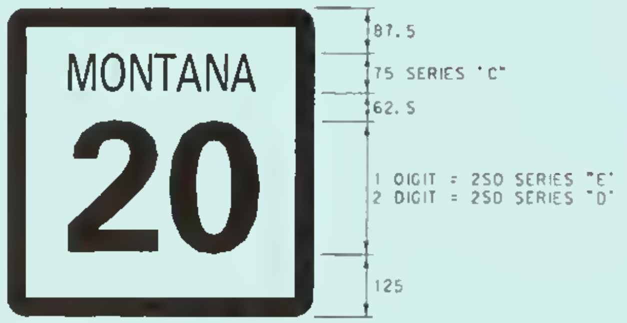
DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 619
DWG. NO.
619-24

CHEVRON MOUNTING DETAILS

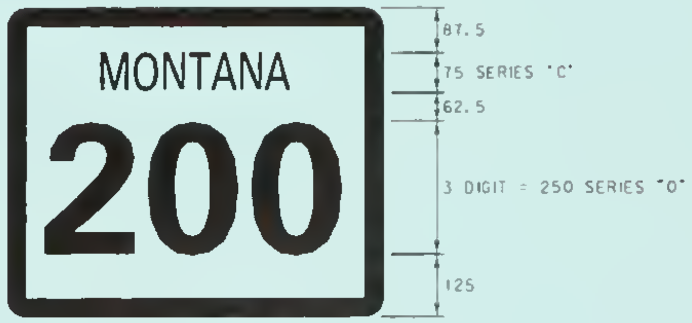
EFFECTIVE: AUGUST 1999

MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

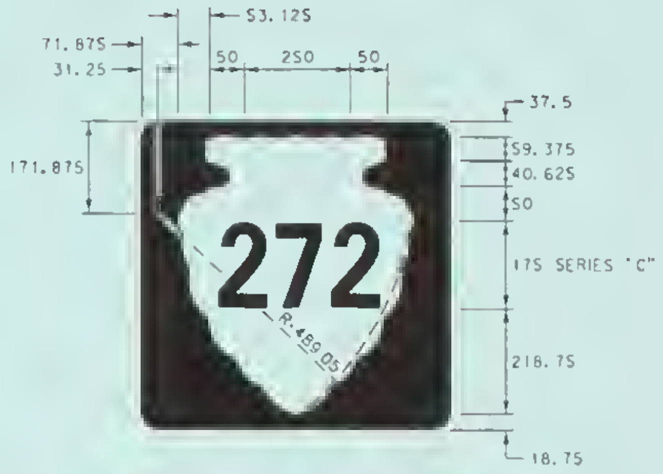
PANELS
FOR USE ON ROUTE MARKER ASSEMBLIES



M1-5
600 x 600
MARGIN = NONE
BORDER = 37.5
CORNER RADIUS = 37.5
BLACK LEGEND AND BORDER ON A RETRO-REFLECTORIZED WHITE BACKGROUND.

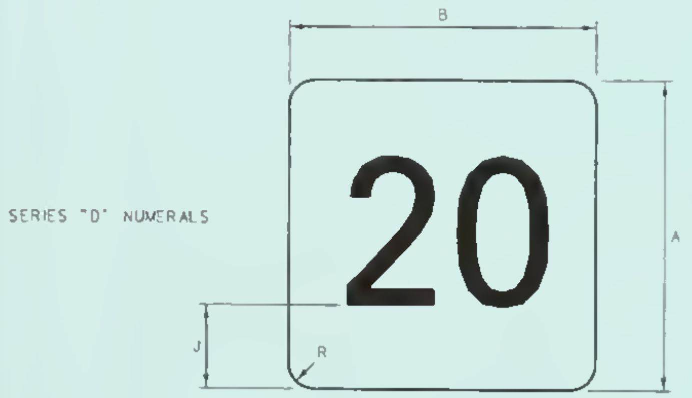


M1-5
750 x 600
MARGIN = NONE
BORDER = 37.5
CORNER RADIUS = 37.5
BLACK LEGEND AND BORDER ON A RETRO-REFLECTORIZED WHITE BACKGROUND.



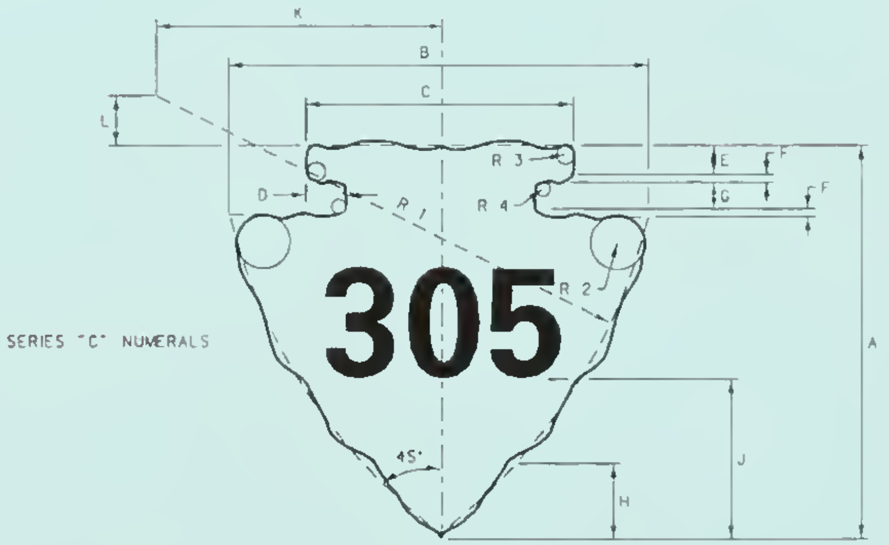
M1-10
600 x 600
MARGIN = NONE
BORDER = SEE DESIGN ABOVE
CORNER RADIUS = 37.5
BLACK LEGEND AND BORDER ON A RETRO-REFLECTORIZED WHITE BACKGROUND.

SHIELDS
FOR USE ON GUIDE SIGNS



	250 mm NUMERALS		300 mm NUMERALS		450 mm NUMERALS	
	2 DIGIT	3 DIGIT	2 DIGIT	3 DIGIT	2 DIGIT	3 DIGIT
A	525	525	600	600	900	900
B	600	750	600	750	900	1125
J	150	150	162.5	162.5	237.5	237.5
R	37.5	37.5	50	50	62.5	62.5

BLACK LEGEND ON A RETRO-REFLECTORIZED WHITE BACKGROUND WITH NO BORDER.



												RADII			
	A	B	C	D	E	F	G	H	J	K	L	R 1	R 2	R 3	R 4
* 200 mm NUMERALS	650	700	462.5	65.625	75	7.8125	50	137.5	275	425	56.25	800	43.75	15.625	7.8125
** 250 mm NUMERALS	800	850	562.5	81.25	90.625	9.375	62.5	168.75	343.75	512.5	50	962.5	50	18.75	9.375
*** 300 mm NUMERALS	1000	1050	700	100	112.5	12.5	75	210.9375	425	625	71.875	1200	62.5	25	12.5

BLACK LEGEND ON A RETRO-REFLECTORIZED WHITE BACKGROUND.

* USE WITH STANDARD 600 mm U.S. SHIELD.

** USE WITH STANDARD 750 AND 900 mm U.S. SHIELD.

*** USE WITH STANDARD 1050 mm U.S. SHIELD AND ALL INDEPENDENT USE.

NOTES:

CENTER ALL NUMERALS USED ON PANELS AND SHIELDS OPTICALLY ABOUT VERTICAL CENTERLINE.

SEE SIGNS AND SIGNING MATERIALS CATALOG FOR COMPLETE LISTING OF SIGNS AND SIGN SIZES. DESIGNS ARE AVAILABLE FROM THE TRAFFIC UNIT FOR SIGNS UNIQUE TO MONTANA.

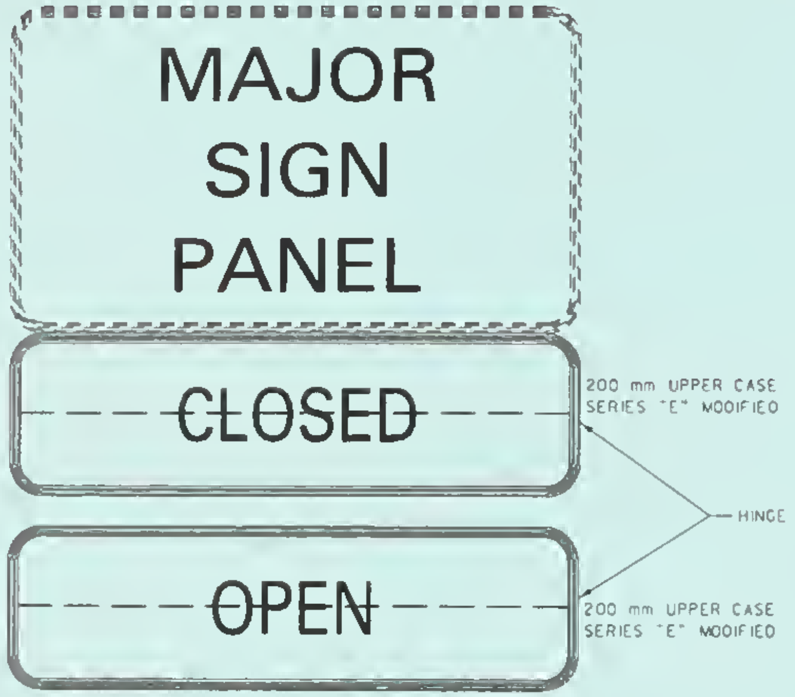
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

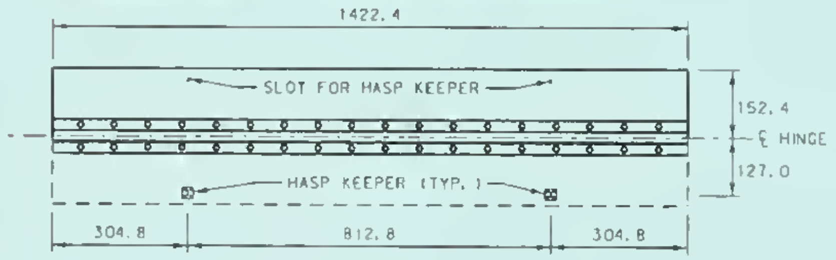
DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 619
DWG. NO.
619-26

SPECIAL DESIGN
ROUTE MARKER
PANELS AND SHIELDS

EFFECTIVE: AUGUST 1999

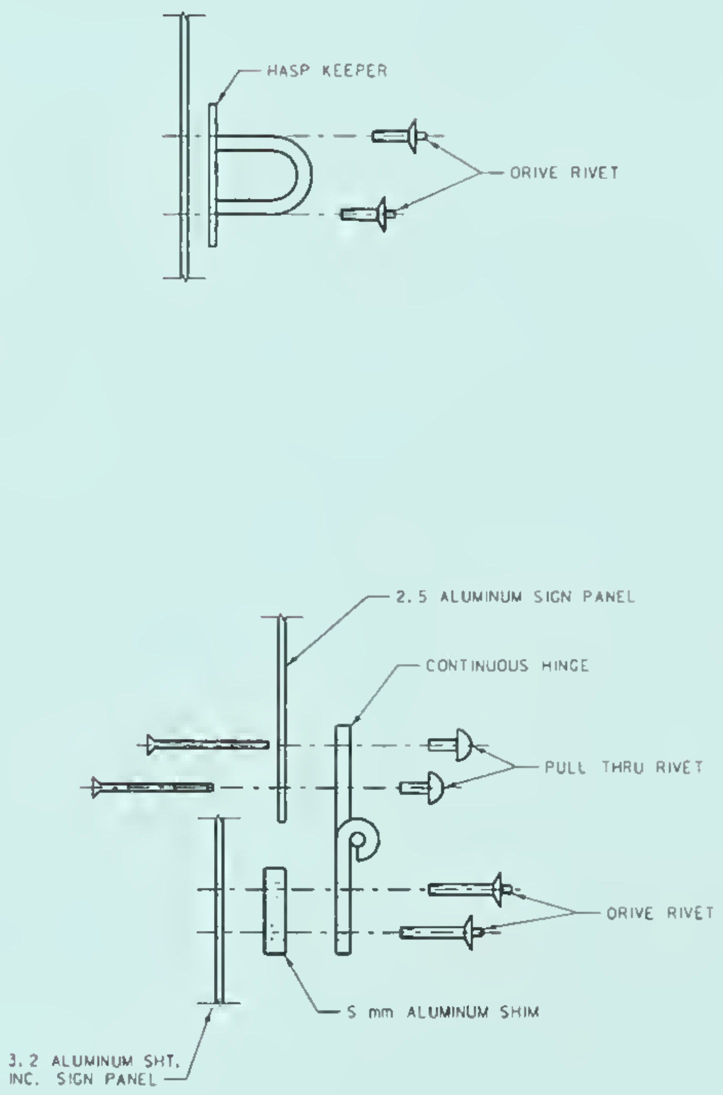
MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



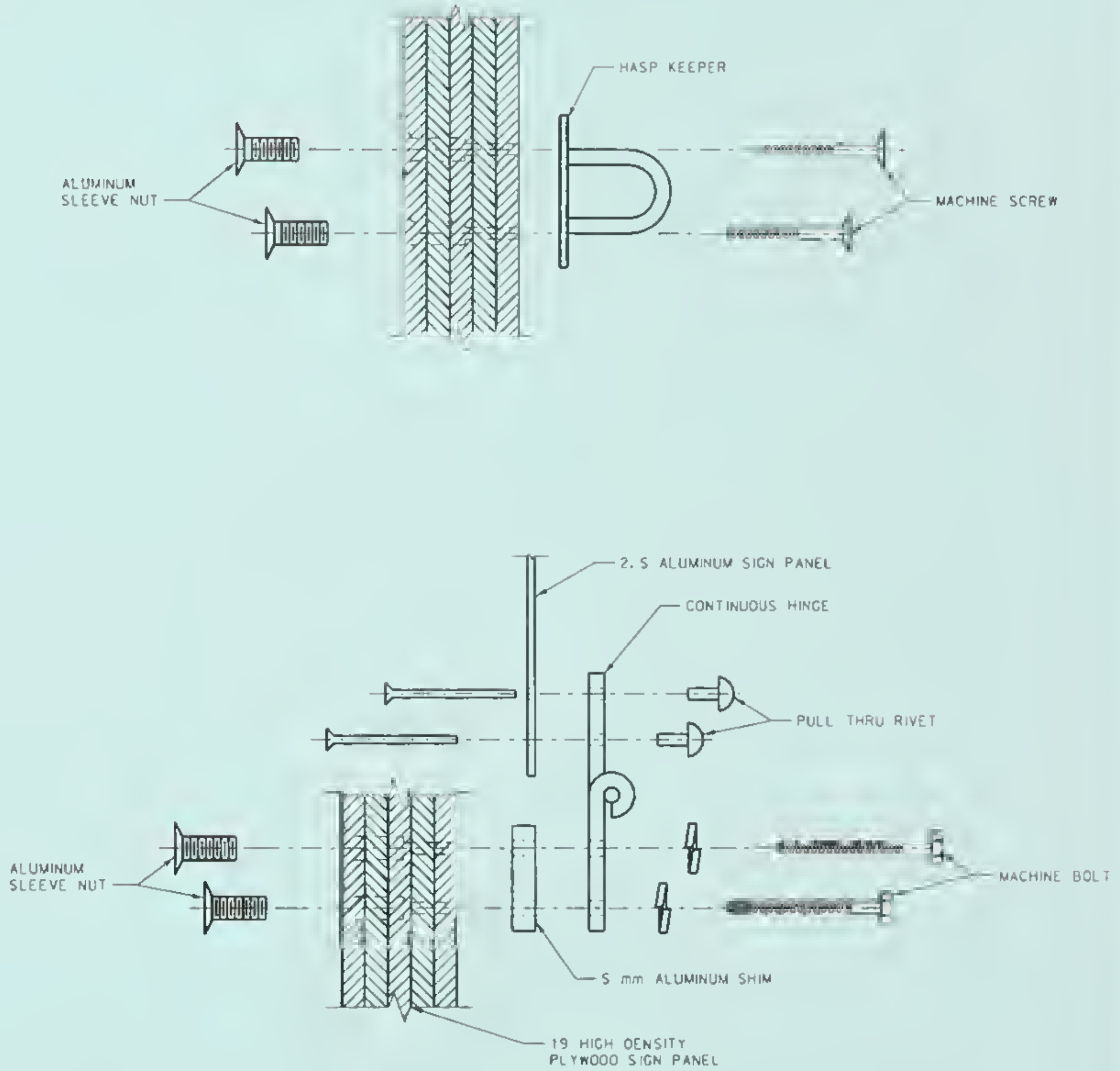


HINGE DETAIL
EXAMPLE
(1650 x 1200 D8-2A WEIGH STATION SIGN SHOWN)

ALUMINUM SHEET MOUNTING



PLYWOOD MOUNTING



NOTES:

SEE SIGNS AND SIGNING MATERIALS CATALOG FOR COMPLETE LISTING OF SIGNS AND SIGN SIZES. DESIGNS ARE AVAILABLE FROM THE TRAFFIC UNIT FOR SIGNS UNIQUE TO MONTANA.

THE SIGN PANEL CONSISTS OF 19 mm HIGH DENSITY PLYWOOD OR 3.2 mm ALUMINUM SHEET INCREMENT AS SPECIFIED ON THE PLANS. THE HINGED PANEL CONSISTS OF 2.5 mm SHEET ALUMINUM.

PAINT ALL HARDWARE VISIBLE ON THE SIGN FACE OR COVER WITH RETRO-REFLECTIVE SHEETING, THE SAME COLOR AS THE SIGN.

SUBMIT SHOP DRAWINGS FOR APPROVAL PRIOR TO FABRICATION.

SUPPLEMENTAL SIGN PANEL BELOW MAJOR SIGN PANEL MUST HAVE RETRO-REFLECTORIZED LEGEND AND BACKGROUND MATCHING COLORS OF MAJOR PANEL.

THE MINIMUM MOUNTING HEIGHT TO THE BOTTOM OF THE SECONDARY PANEL IS 1.5 m.

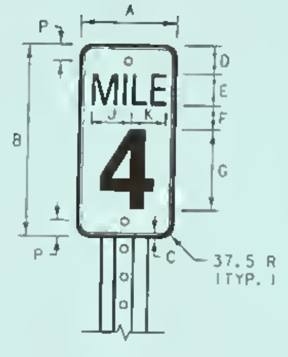
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 619.704
DWG. NO.
619-30

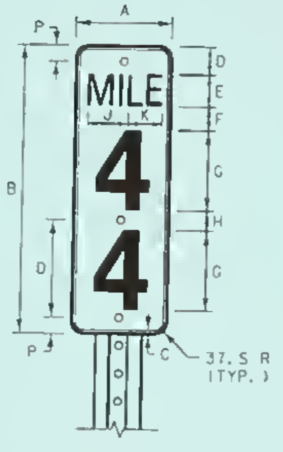
SIGN HINGE
DETAILS

EFFECTIVE: AUGUST 1999

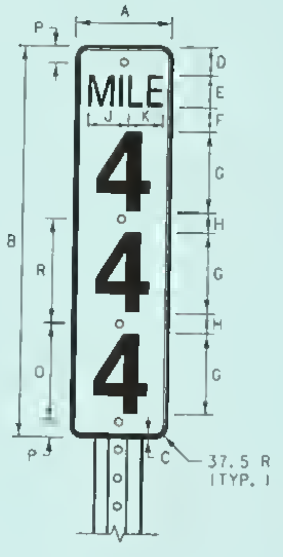
MONTANA DEPARTMENT
OF TRANSPORTATION
MONTANA
CADD



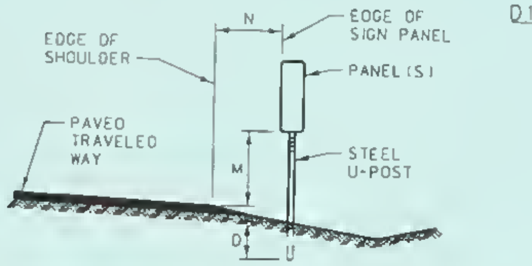
D10-1 AND D10-4



D10-2 AND D10-5



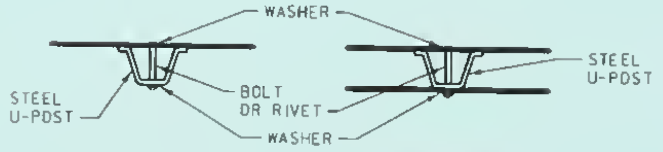
D10-3 AND D10-6



DIMENSION	INTERSTATE	NON-INTERSTATE
M	1.2 m	1.2 m
N	1.8 m	0.6 m TO 1.8 m *
D	0.6 m MIN.	0.6 m MIN.

* NORMALLY IN LINE WITH DELINEATORS

TYPICAL PLACEMENT



SINGLE PANEL

DOUBLE PANEL

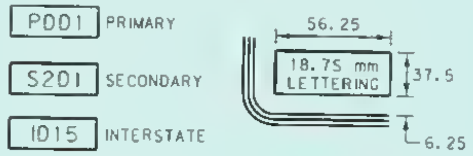
TYPICAL PANEL MOUNTING

PANEL DIMENSION INFORMATION

DIMENSION	INTERSTATE D10-4 (1 DIGIT)	 D10-5 (2 DIGIT)	 D10-6 (3 DIGIT)
A	300	300	300
B	600	900	1200
C	12.5	12.5	12.5
D	87.5	75	75
E	100 SERIES "C"	100 SERIES "C"	100 SERIES "C"
F	75	75	75
G ⊗	250 SERIES "C"	250 SERIES "C"	250 SERIES "C"
H	~	75	62.5
J	115	115	115
K	120	120	120
P	50	50	50
O	~	325	300
R	~	~	325

DIMENSION	NON-INTERSTATE D10-1 (1 DIGIT)	 D10-2 (2 DIGIT)	 D10-3 (3 DIGIT)
A	250	250	250
B	450	675	900
C	12.5	12.5	12.5
D	50	50	50
E	100 SERIES "B"	100 SERIES "B"	100 SERIES "B"
F	50	50	50
G ⊗	150 SERIES "C"	150 SERIES "C"	150 SERIES "C"
H	~	75	75
J	90	90	90
K	95	95	95
P	37.5	37.5	37.5
O	~	250	250
R	~	~	225

⊗ OPTICALLY CENTER DIGITS ON VERTICAL ℄ OF PANEL.



ROUTE IDENTIFICATION STICKERS

ON NEW SIGNING PROJECTS, FURNISH AND PLACE ROUTE NUMBER IDENTIFICATION STICKERS UPON BACKS OF ALL SIGNS BEFORE FINAL ACCEPTANCE OF THE PROJECT.

PLACE THE STICKER DISPLAYING THE FEDERAL AID ROUTE NUMBER IN THE LOWER LEFT CORNER OF THE REFERENCE POST SIGN, NEAREST THE EDGE OF THE ROADWAY.

NOTES:

REFERENCE POST PANELS CONSIST OF A RETRO-REFLECTORIZED WHITE LEGEND AND BORDER ON A RETRO-REFLECTORIZED GREEN BACKGROUND.

MOUNT ALL REFERENCE POSTS ON STEEL U-POSTS (MIN. 3 kg/m) EXCEPT THE D10-6, WHICH IS MOUNTED ON A STEEL U-POST (MIN. 4.5 kg/m) AS NOTED IN THE SIGNING PLANS.

USE GALVANIZED OR CADMIUM PLATED M8 BOLT, NUT AND WASHER, AND JAM THREADS AFTER TIGHTENING. USE 8 mm DIA. ALUMINUM OR CADMIUM PLATED BOLT RIVETS OR PAINT RIVET HEADS WITH BRILLIANT GREEN SIGN ENAMEL.

DO NOT RELOCATE OR MOVE A REFERENCE POST ONCE IT HAS BEEN PROPERLY PLACED.

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 619
DWG. NO.
619-32

REFERENCE POST DETAILS

EFFECTIVE: AUGUST 1999

MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

DESIGN A USAGE:

USE FOR CONTINUOUS DELINEATION AND RT. SHOULDER OF ALL ROUTES.

DESIGN H USAGE:

USE ON LT. SHOULDER OF INTERSTATE ROUTES.

DESIGN B USAGE:

USE ON LT. SHOULDER OF INTERSTATE RAMPS.

DESIGN G USAGE:

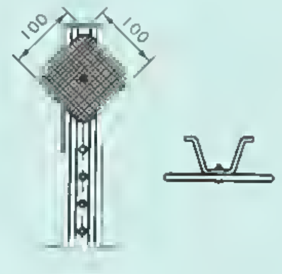
USE ON RT. SHOULDER OF INTERSTATE RAMPS.

DESIGN J USAGE:

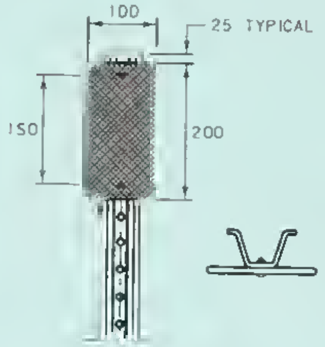
USE FOR TRUCK ESCAPE RAMPS ONLY.

DESIGN C USAGE:

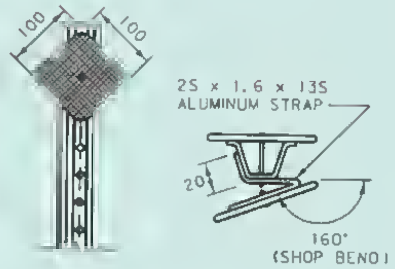
USE FOR CURVES WITH RADII 170 m OR LESS. BOTH OUTSIDE AND INSIDE OF CURVE.



DESIGN A (WHITE)
DESIGN H (YELLOW)



DESIGN B (YELLOW)
DESIGN G (WHITE)
DESIGN J (RED)



DESIGN C (WHITE)

DESIGN D USAGE:

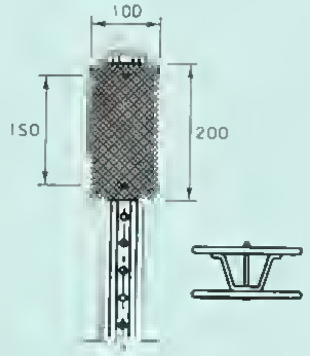
NON-INTERSTATE ROUTES: USE AT APPROACHES WITH STOP OR YIELD SIGNS.
INTERSTATE ROUTES: USE FOR RAMP TERMINATION AT CROSS ROAD.

DESIGN E USAGE:

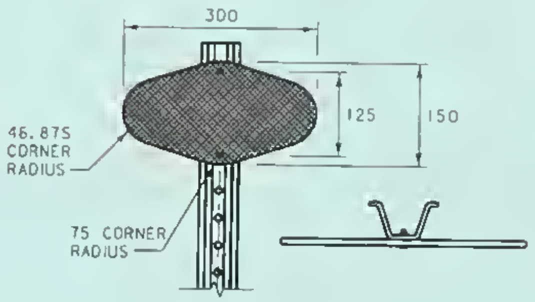
SPECIAL USE ONLY. FORMERLY USED AT GORES AND ISLAND NOSES.

DESIGN F USAGE:

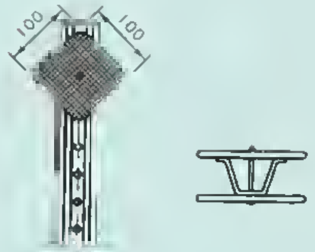
USE FOR CURVES WITH RADII GREATER THAN 170 m:
450 m TO 231 m RADIUS: OUTSIDE ONLY.
230 m TO 171 m RADIUS: OUTSIDE AND INSIDE OF CURVE.



DESIGN D (YELLOW)



DESIGN E (YELLOW)



DESIGN F (WHITE)

DELINEATOR LEGEND	
DESIGN "A"	⊣
DESIGN "B"	⊣‖
DESIGN "C"	⊢⊣
DESIGN "D"	‖⊢⊣‖
DESIGN "E"	⊣‖‖
DESIGN "F"	⊢⊣
DESIGN "G"	─<
DESIGN "H"	→
DESIGN "J"	─×

NOTE:
SOME TYPICAL USES ARE SHOWN FOR EACH DESIGN. REFER TO THE MUTCD FOR SPECIFIC GUIDANCE.

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 619
DWG. NO.
619-34

DELINEATOR DETAILS

EFFECTIVE: AUGUST 1999

MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

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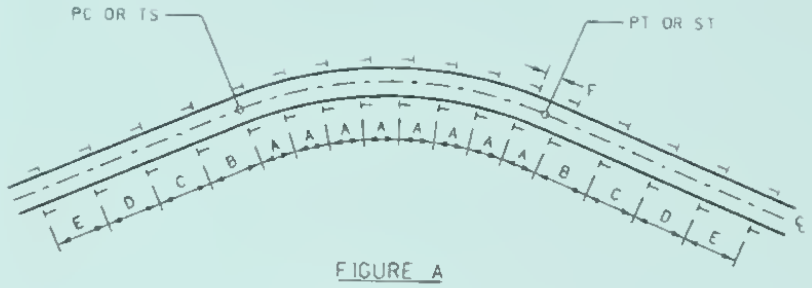


FIGURE A
SEE TABLE BELOW FOR SPACING VALUES

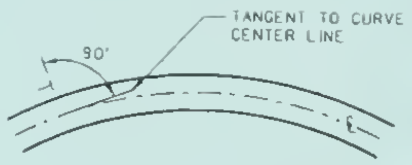


FIGURE B

HORIZONTAL CURVE SPACING TABLE					
RADIUS, m	SPACING ON CURVE, m	SPACING ON BOTH APPROACH TANGENTS, m			
	A	B	C	D	E
1750 & UP	90	120	120	120	120
900 - 1749	65	120	120	120	120
600 - 899	50	95	120	120	120
450 - 599	40	75	120	120	120
300 - 449	35	65	100	120	120
200 - 299	25	55	80	120	120
150 - 199	20	45	70	90	120
100 - 149	20	35	55	90	120
0 - 99	15	25	40	80	120

NOTES:

FURNISH RETRO-REFLECTIVE SHEETING ACCORDING TO THE STANDARD SPECIFICATIONS FOR RETRO-REFLECTIVE SHEETING B (HIGH INTENSITY). POSITION DELINEATOR FACES PERPENDICULAR TO TANGENT TO CENTERLINE OF CURVE AS SHOWN IN FIGURE B.

MOUNT DELINEATORS ON METAL U-POSTS (MIN. 1.7 kg/m) WITH 5 mm DIA. CADMIUM PLATED BOLT(S). DRILL OR PUNCH A MINIMUM OF TWELVE 9.5 mm MAXIMUM DIAMETER HOLES ON 25 mm CENTERS FROM THE TOP OF THE POST. 6.4 mm SQUARE HOLES MAY BE USED. IF SQUARE HOLES ARE USED, USE A LARGE HEADED BOLT OR AN APPROPRIATE WASHER. JAM THREADS AFTER TIGHTENING THE NUT TO PREVENT REMOVAL.

PLACE DELINEATORS AT A CONSTANT CLEARANCE DISTANCE FROM THE EDGE OF THE PAVEMENT EXCEPT WHERE GUARDRAIL OR OTHER OBSTRUCTIONS INTERFERE. ALIGN THE DELINEATORS WITH THE INSIDE EDGE OF THE OBSTRUCTION. CLEARANCE FOR DELINEATORS IS 1.8 m ON INTERSTATE HIGHWAYS, 0.6 m TO 1.8 m ON PRIMARY AND SECONDARY HIGHWAYS OR AS DETERMINED BY THE ENGINEER. THE STANDARD MOUNTING HEIGHT IS 1.2 m TO THE TOP OF THE POST. SUPPLY POST LENGTHS TO MAINTAIN THE PROPER MOUNTING HEIGHT AND A MINIMUM OF 0.45 m EMBEDMENT.

SPACE DELINEATORS ACCORDING TO THE DISTANCES FOUND IN THE TABLE ABOVE OR AS SPECIFIED IN THE PLANS. IN FIGURE A, IF "F" IS GREATER THAN 6 m ADD ONE REGULAR DELINEATOR IN AT "A" SPACING. UNDER NORMAL SPACING, SHOULD A DELINEATOR FALL WITHIN A CROSSROAD OR APPROACH, IT MAY BE MOVED IN EITHER DIRECTION A DISTANCE NOT TO EXCEED ONE QUARTER OF THE NORMAL SPACING. ELIMINATE DELINEATORS STILL FALLING IN SUCH AREAS.

ALL DELINEATOR REFLECTORS HAVE 18.75 mm CORNER RADII EXCEPT DESIGN "E".

MOUNT THE DELINEATOR REFLECTOR 25 mm BELOW THE TOP OF THE METAL U-POST.

WHEN THE ROADWAY ADT IS LESS THAN 900, DELINEATE ALL CURVES WITH 450 METER RADII OR LESS.

CONTINUOUSLY DELINEATE ROADWAYS WHEN THE ADT IS 900 AND GREATER, OR BY ENGINEERING JUDGEMENT.

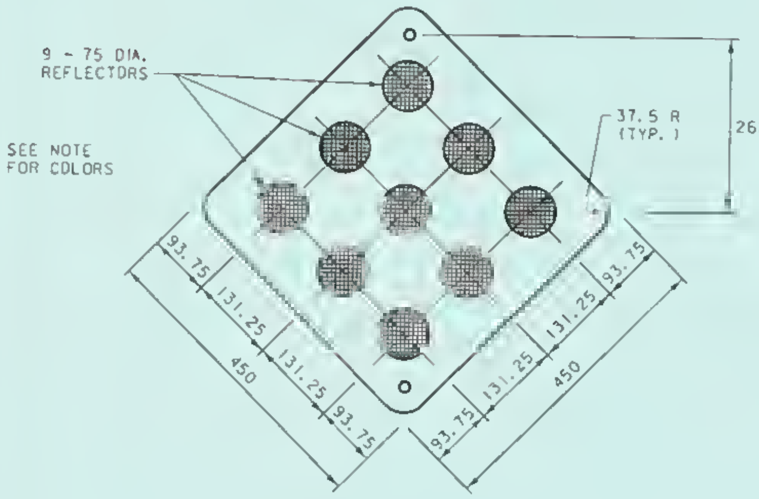
DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 619, 704
DWG. NO.
619-36

DELINEATOR PLACEMENT
DETAILS

EFFECTIVE: AUGUST 1999

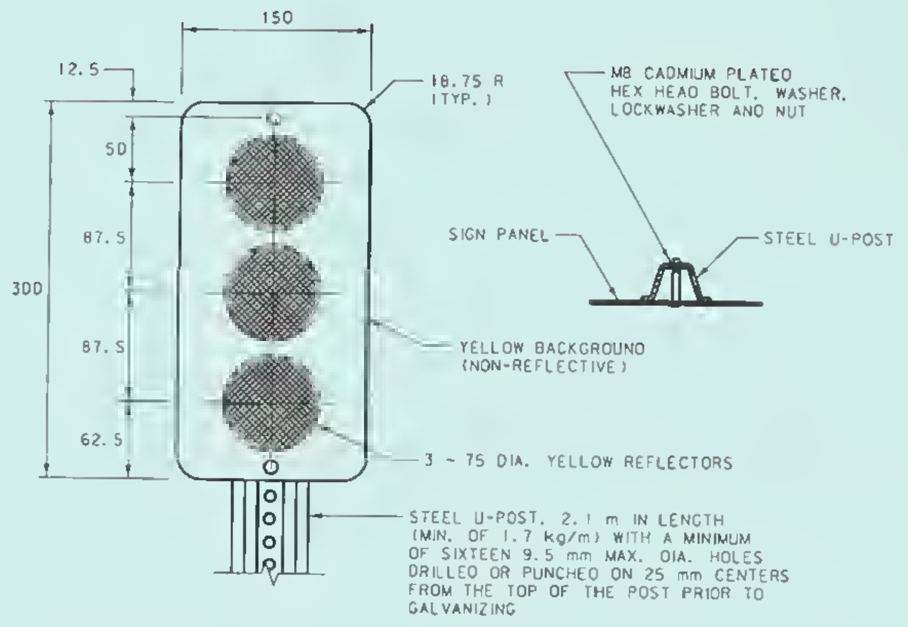
MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

TYPE 1
X3-2



NOTE:
TYPE 1 OBJECT MARKERS HAVE YELLOW REFLECTORS ON A YELLOW OR BLACK BACKGROUND OR AN ALL YELLOW RETRO-REFLECTORIZED PANEL OF THE SAME SIZE. IF USED AS END OF ROAD MARKERS, TYPE 1 MARKERS ARE RETRO-REFLECTORIZED RED OR HAVE RED REFLECTORS ON A RED OR BLACK BACKGROUND.

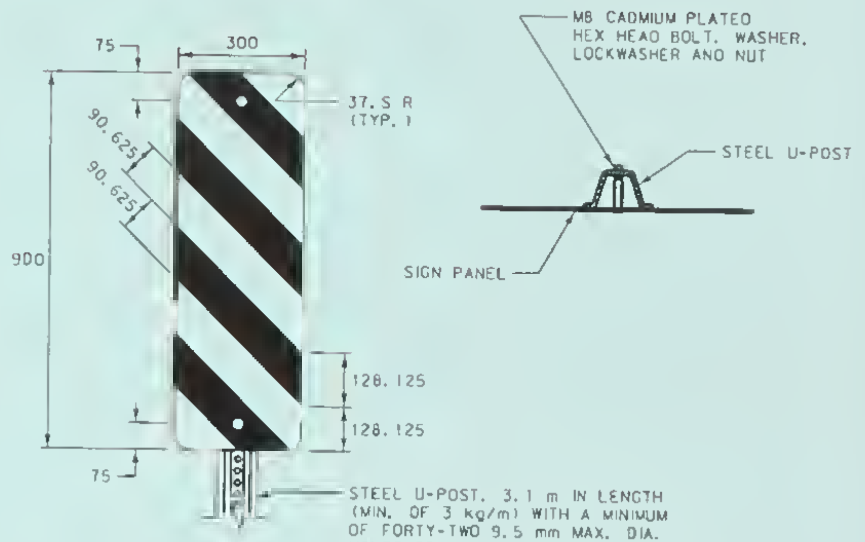
TYPE 2
X3-3



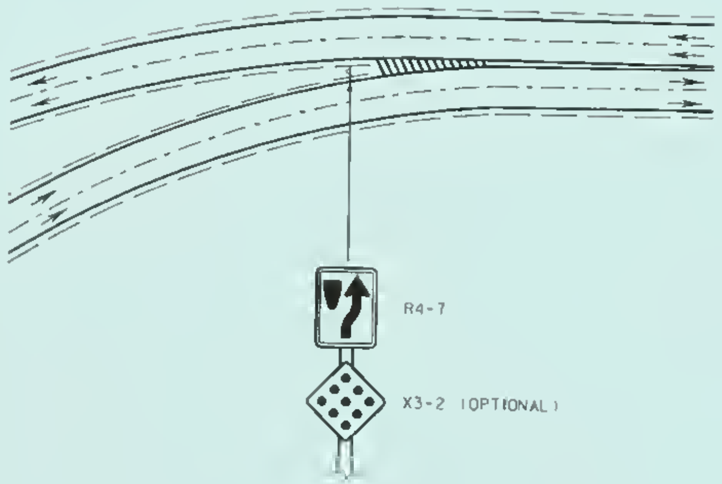
STEEL U-POST, 2.1 m IN LENGTH (MIN. OF 1.7 kg/m) WITH A MINIMUM OF SIXTEEN 9.5 mm MAX. DIA. HOLES DRILLED OR PUNCHED ON 25 mm CENTERS FROM THE TOP OF THE POST PRIOR TO GALVANIZING

ALTERNATE DESIGN FOR TYPE 2 OBJECT MARKERS IS A YELLOW RETRO-REFLECTORIZED PANEL OF THE SAME SIZE.

TYPE 3
OM-3
(OM-3L SHOWN)

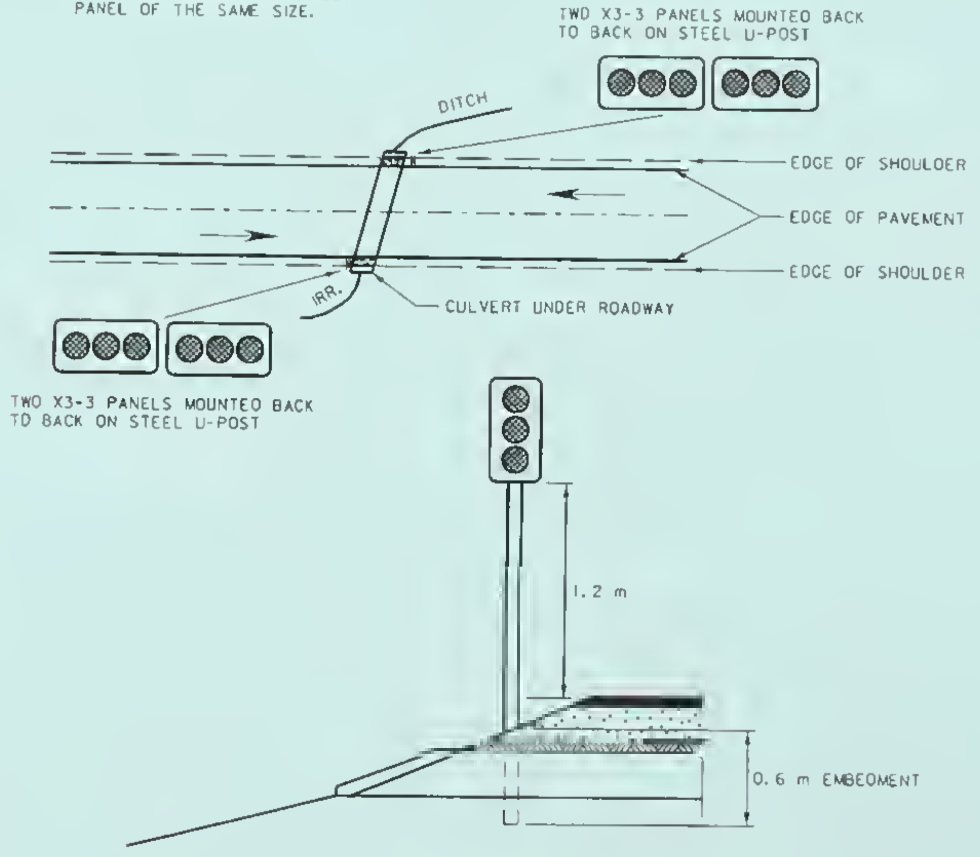


STEEL U-POST, 3.1 m IN LENGTH (MIN. OF 3 kg/m) WITH A MINIMUM OF FORTY-TWO 9.5 mm MAX. DIA. HOLES DRILLED OR PUNCHED ON 25 mm CENTERS FROM THE TOP OF THE POST PRIOR TO GALVANIZING



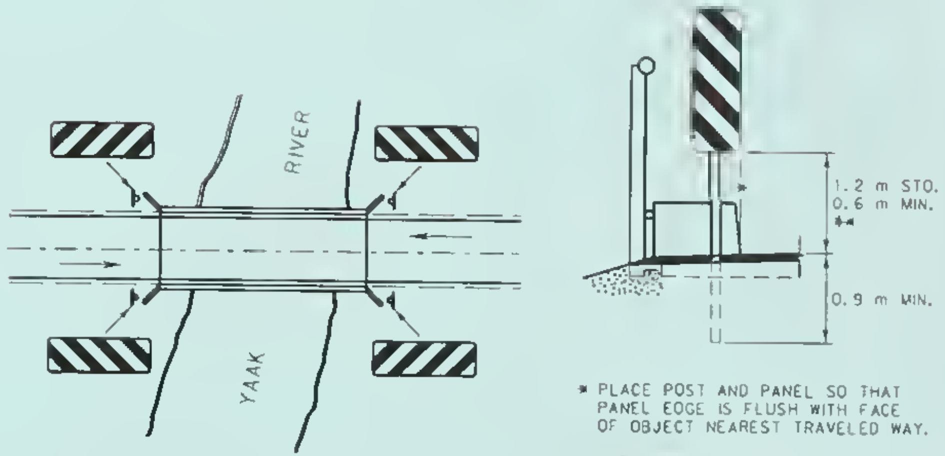
TYPICAL USE AND PLACEMENT

PLACEMENT OF X3-2 IS USED ONLY AS OPTIONAL TO ENHANCE TARGET VALUE WHEN NEEDED.



PLACE POST AND PANEL(S) SO THAT PANEL(S) ARE DIRECTLY ADJACENT TO INNER-MOST EDGE OF OBJECT NEAREST TRAVELED WAY.

TYPICAL USE AND PLACEMENT



* PLACE POST AND PANEL SO THAT PANEL EDGE IS FLUSH WITH FACE OF OBJECT NEAREST TRAVELED WAY.

** WHEN MOUNTED 2.4 m OR MORE FROM CURB OR SHOULDER, THE MOUNTING HEIGHT IS MEASURED FROM THE GROUND LINE INSTEAD OF THE EDGE OF PAVEMENT.

TYPICAL USE AND PLACEMENT

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING

REFERENCE STANDARD SPEC. SECTION 619	DWG. NO. 619-38

OBJECT MARKER DESIGN AND
PLACEMENT DETAILS FOR OBSTRUCTIONS
ADJACENT TO OR WITHIN HIGHWAYS

EFFECTIVE: AUGUST 1999

MDT *MONTANA DEPARTMENT OF TRANSPORTATION* MONTANA CADD

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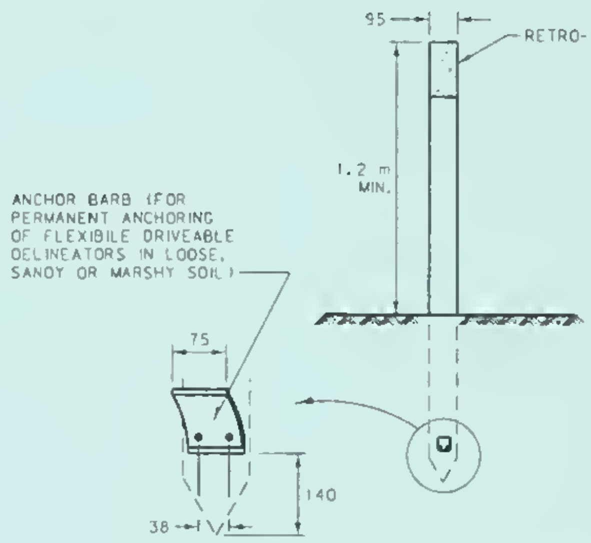
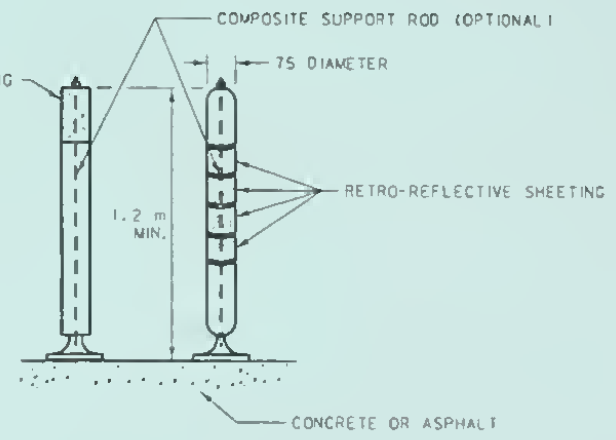

95
RETRO-REFLECTIVE SHEETING
1.2 m MIN.
ANCHOR BARB (FOR PERMANENT ANCHORING OF FLEXIBILE DRIVEABLE DELINEATORS IN LOOSE, SANDY OR MARSHY SOIL)
75
140
38

FLEXIBLE DRIVEABLE
DELINEATORS


COMPOSITE SUPPORT ROD (OPTIONAL)
75 DIAMETER
RETRO-REFLECTIVE SHEETING
1.2 m MIN.
RETRO-REFLECTIVE SHEETING
CONCRETE OR ASPHALT

DETAILS ARE REPRESENTATIVE ONLY.
ACTUAL DESIGN USED/SPECIFIED MAY
VARY (SEE PLANS).

FLEXIBLE SURFACE-MOUNTED
DELINEATORS

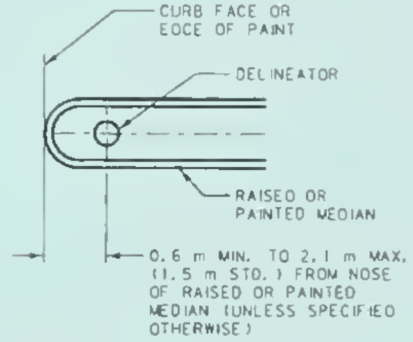
NOTES:

USE FLEXIBLE DELINEATORS SIMILAR TO THE DESIGN AND SPECIFICATIONS SHOWN ON THIS SHEET OR IN THE SIGNING PLANS OF THE CONTRACT.

MOUNT OR EMBED FLEXIBLE DELINEATORS TO THE MANUFACTURER'S SPECIFICATIONS.

RETRO-REFLECTORIZE FLEXIBLE DELINEATORS, IF REQUIRED IN PLAN SPECIFICATIONS, BY THE ADDITION OF DELINEATOR CRYSTALS, EITHER 37.5 mm x 175 mm OR 75 mm DIAMETER, OR BY ADDING TWO 75 mm MINIMUM WIDTH BANDS OF RETRO-REFLECTIVE SHEETING TYPE HI, 360° AROUND THE TOP OF THE DELINEATOR. USE THE COLOR OF THE DELINEATOR CRYSTALS OR RETRO-REFLECTORIZED MATERIAL AS SHOWN IN THE SIGNING PLANS OF THE CONTRACT OR THE MUTCD.

THE EXACT LOCATION AND PLACEMENT OF THE FLEXIBLE DELINEATORS ARE SHOWN IN THE SIGNING PLANS.


CURB FACE OR EDGE OF PAINT
DELINEATOR
RAISED OR PAINTED MEDIAN
0.6 m MIN. TO 2.1 m MAX. (1.5 m STD.) FROM NOSE OF RAISED OR PAINTED MEDIAN (UNLESS SPECIFIED OTHERWISE)

TYPICAL USE AND PLACEMENT

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 619
DWG. NO.
619-40

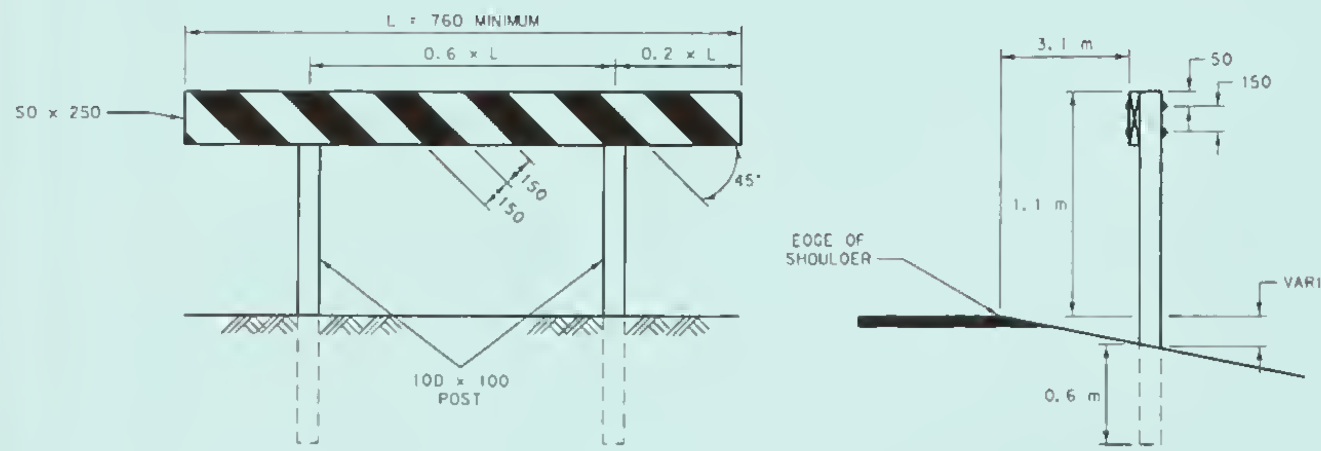
FLEXIBLE DELINEATORS

EFFECTIVE: AUGUST 1999

MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

BI BARRICADE

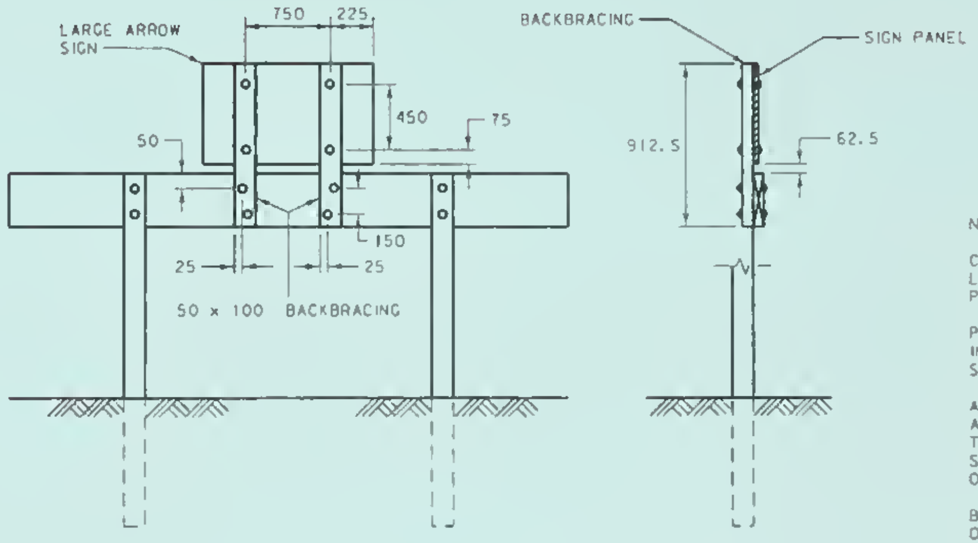
B(I)-L SHOWN



FRONT VIEW

RIGHT SIDE VIEW

BARRICADE DETAILS



REAR VIEW

LEFT SIDE VIEW

SIGN MOUNTING DETAILS

NOTES:

CONSTRUCT ALL BARRICADES OF COMMERCIAL GRADE S4S LUMBER. USE M10 GALVANIZED CARRIAGE OR CADMIUM PLATED BOLTS, WASHERS AND NUTS FOR ALL CONNECTIONS.

PAINT ALL BARRICADES WITH TWO COATS OF WHITE PAINT IN ACCORDANCE WITH SECTION 710 OF THE STANDARD SPECIFICATIONS.

ALL BARRICADES HAVE ALTERNATING RETRO-REFLECTIVE RED AND WHITE STRIPES, 150 mm IN WIDTH AT AN ANGLE OF 45° TO THE VERTICAL, SLANTING DOWNWARD TOWARD THE SIDE OR SIDES ON WHICH TRAFFIC IS TO FLOW. NOMINAL DIMENSIONS OF ROLL MATERIAL FOR STRIPES IS ACCEPTABLE.

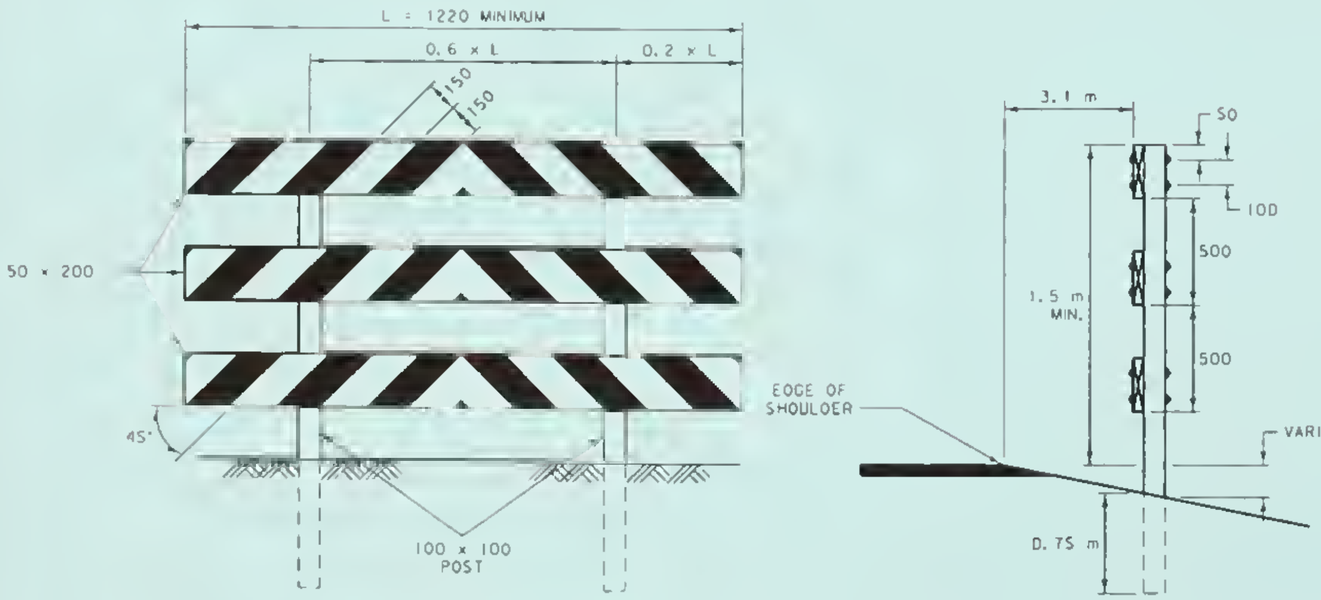
BARRICADES DESIGNATED "L" ARE PLACED ON THE LEFT SIDE OF APPROACHING TRAFFIC. BARRICADES DESIGNATED "R" ARE PLACED ON THE RIGHT SIDE OF APPROACHING TRAFFIC.

RETRO-REFLECTORIZE ALL BARRICADES WITH THE SHEETING MOUNTED ON A SHEET ALUMINUM BACKING AT LEAST 0.5 mm THICK. USE ALUMINUM ALLOY 6061-T6 OR AA5052-H38 CONFORMING TO ASTM DESIGNATION B 209M. SECURE RETRO-REFLECTIVE ALUMINUM SHEETING WITH ALUMINUM NAILS.

DETERMINE THE POST LENGTHS IN THE FIELD, COMPLYING WITH THE MOUNTING HEIGHTS AND FOUNDATION DEPTHS LISTED ON THIS SHEET.

BIII BARRICADE

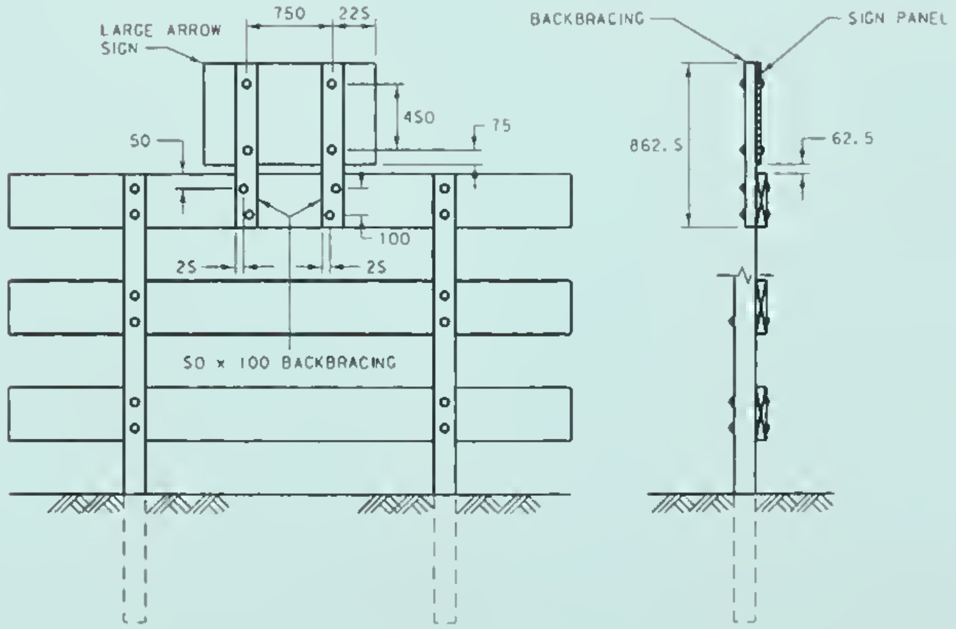
B(III)-L & R SHOWN



FRONT VIEW

RIGHT SIDE VIEW

BARRICADE DETAILS



REAR VIEW

LEFT SIDE VIEW

SIGN MOUNTING DETAILS

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 619
DWG. NO.
619-42

PERMANENT BARRICADE
DESIGN DETAILS

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

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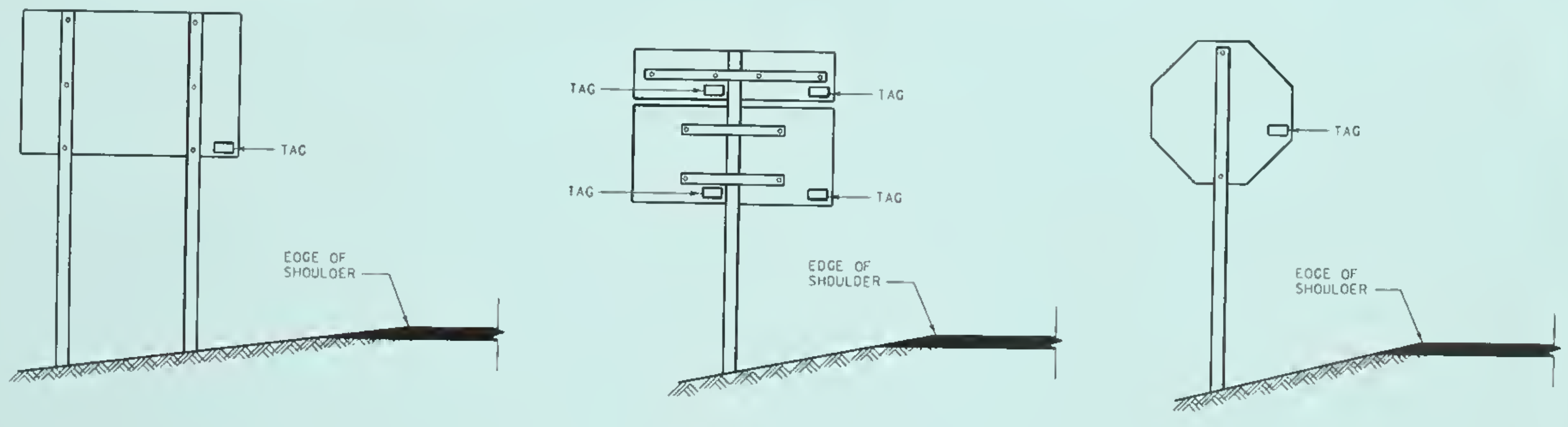
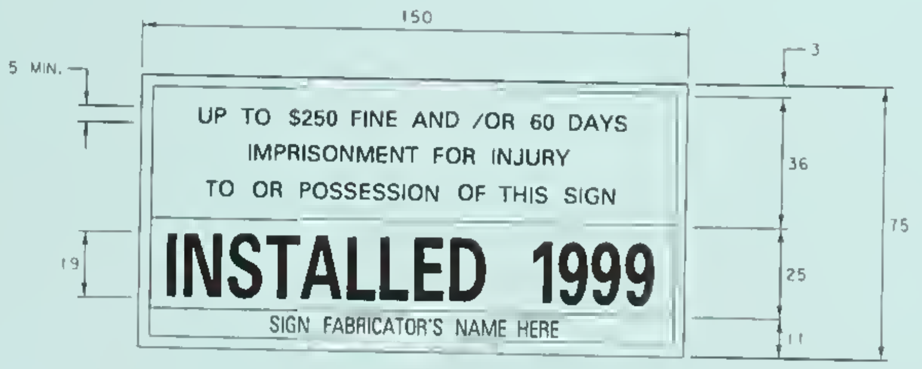


PLACEMENT DETAILS


150
5 MIN.
3
36
75
25
11
19
UP TO $250 FINE AND /OR 60 DAYS
IMPRISONMENT FOR INJURY
TO OR POSSESSION OF THIS SIGN
INSTALLED 1999
SIGN FABRICATOR'S NAME HERE

ATE TAG DETAIL

NOTES:

FURNISH AND PLACE INSTALLATION DATE TAGS ON ALL SIGNS PRIOR TO FINAL ACCEPTANCE OF THE PROJECT.

THE TAGS DISPLAY THE YEARS IN WHICH THE SIGNS WERE INSTALLED. SEE THE COLOR SEQUENCE TABLE SHOWN ON THIS DRAWING FOR THE APPROPRIATE COLORS. DATE TAGS ARE TO BE RETRO-REFLECTIVE.

PLACE A TAG ON THE BACK OF EACH SIGN, LOCATED NEAR THE LOWER CORNER OF THE SIGN NEAREST THE EDGE OF ROADWAY, TO BE VISIBLE FROM THE ROADWAY AS SHOWN IN THE EXAMPLES ABOVE.

PLACE TAGS ON ANY NEW SIGN INSTALLED IN THE FIELD AS ROUTINE MAINTENANCE BY MDT FORCES. MAINTENANCE DESIGN DATE TAGS CAN BE ORDERED FROM THE SIGN SHOP IN HELENA.

DATE TAG COLOR SEQUENCE

DATE TAG COLOR CORRESPONDS TO THE LAST DIGIT OF THE INSTALLATION YEAR AS FOLLOWS:

0 - YELLOW
1 - WHITE
2 - LIGHT BLUE
3 - GOLD
4 - LIGHT GREEN
5 - RED
6 - PURPLE
7 - ORANGE
8 - BLUE
9 - GREEN

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 619
DWG. NO.
619-44

INSTALLATION
DATE TAGS

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

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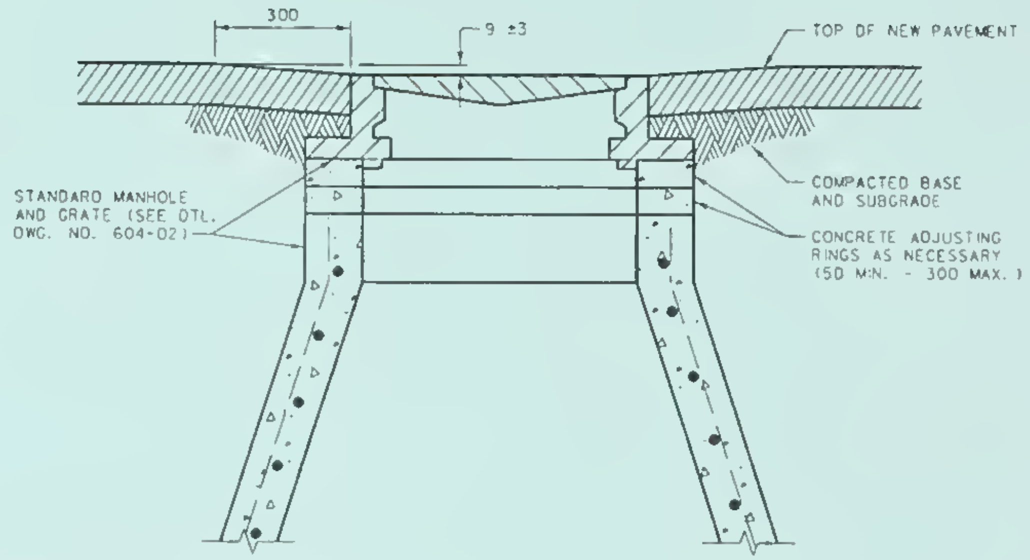

300
9 ±3
TOP OF NEW PAVEMENT
STANDARD MANHOLE AND GRATE (SEE DTL. DWG. NO. 604-02)
COMPACTED BASE AND SUBGRADE
CONCRETE ADJUSTING RINGS AS NECESSARY (50 MIN. - 300 MAX.)

NOTES:

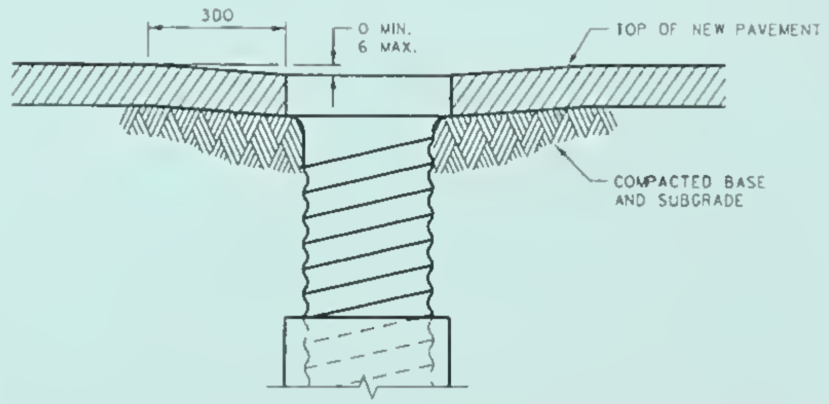
ADJUST MANHOLES UPWARD WITH ADJUSTING RINGS UNDER FRAME.

ADJUST MANHOLES DOWNWARD BY REMOVING CONE AND BARREL SECTIONS AS NECESSARY AND REPLACING WITH SECTIONS OF LENGTH REQUIRED TO MATCH GRADE.

SLOPE MANHOLE FRAME AS REQUIRED TO MATCH SLOPE OF STREET.

MAKE FINAL MANHOLE ADJUSTMENTS BEFORE PAVING.

MANHOLE ADJUSTMENT DETAIL



NOTES:

ADJUST WATER VALVES UPWARD OR DOWNWARD AS REQUIRED.

MAKE FINAL ADJUSTMENT BEFORE PAVING.

VALVE BOX ADJUSTMENT DETAIL

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 604, 621
DWG. NO.
621-00

MANHOLE AND
VALVE BOX
ADJUSTMENT DETAILS

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

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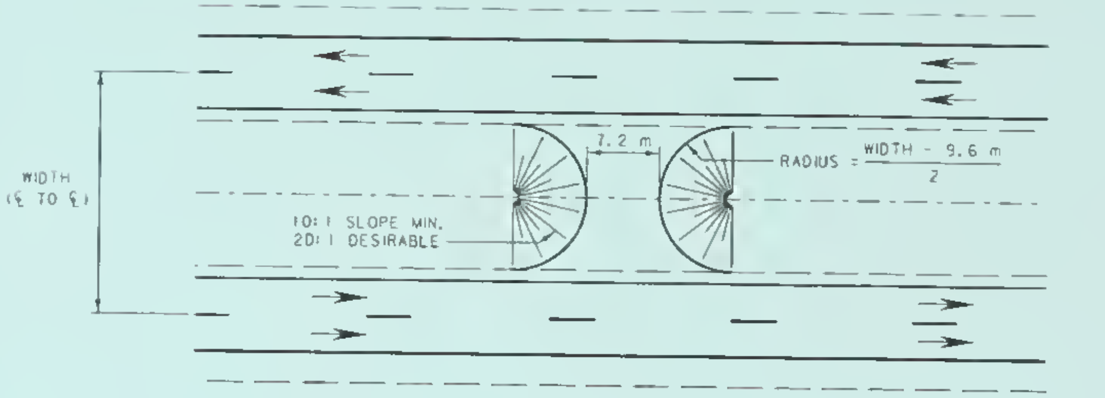
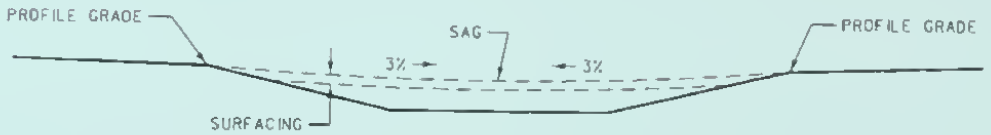


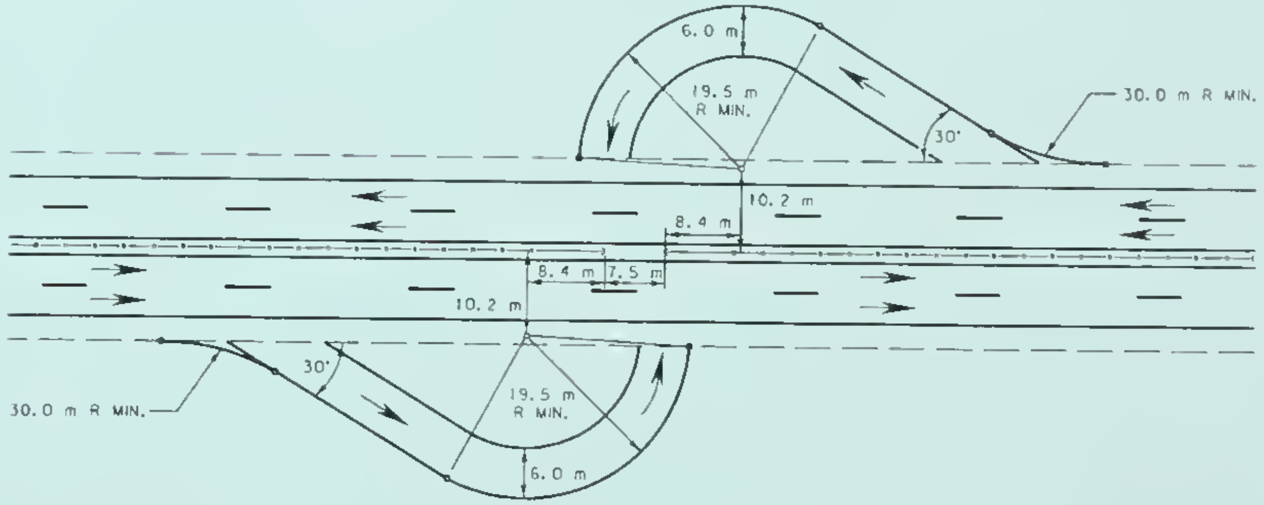
PLAN



PROFILE

MEDIAN WIDTHS 10.8 m TO 22.8 m

LOCATE AND CONSTRUCT TURNOUTS ABOVE IN CONJUNCTION WITH DITCH BLOCKS IF AT ALL POSSIBLE. PROVIDE DRAINAGE WHEN NECESSARY.



STANDARD U-TURN FOR NARROW MEDIANS

NOTES:

NARROW MEDIANS. MEDIAN WIDTHS GREATER THAN 22.8 m. AND INDEPENDENT ROADWAYS REQUIRE SPECIAL DESIGN.

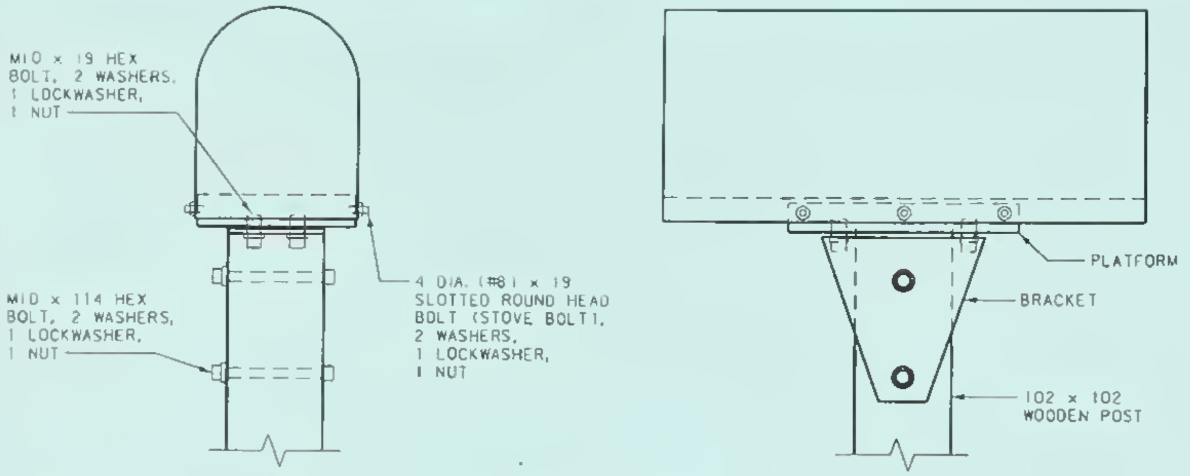
GRADES: UNIFORM BETWEEN INSIDE SHOULDERS OF MAIN TRAVELED WAY EXCEPT FOR SPECIAL DESIGN.
SURFACING: SEE PLANS FOR QUANTITIES.
DRAINAGE: USE 450 mm OR 600 mm CULVERTS IF REQUIRED.

DETAILED DRAWING
REFERENCE DWG. NO.
STANDARD SPEC.
SECTION 900-00

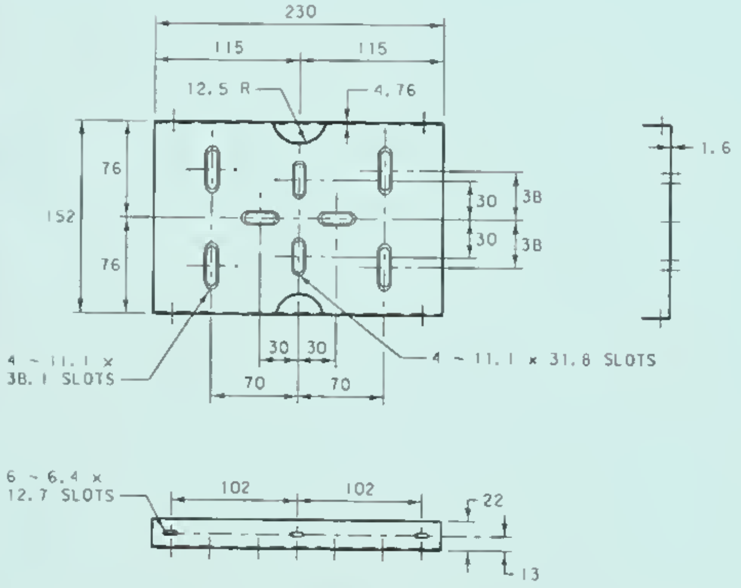
U-TURN MEDIAN OPENINGS
ON CONTROLLED
ACCESS HIGHWAYS

EFFECTIVE AUGUST 1999

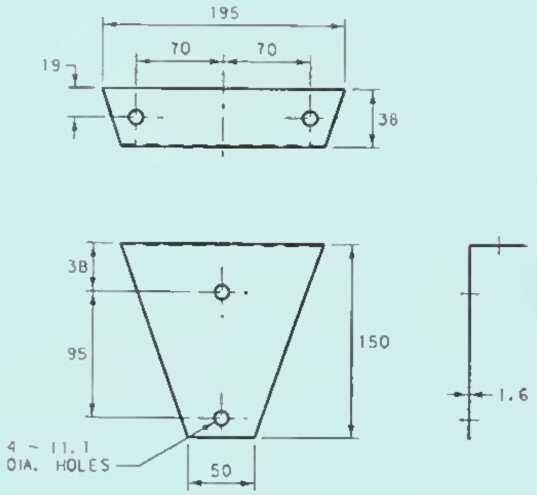
MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD


M10 × 19 HEX BOLT, 2 WASHERS, 1 LOCKWASHER, 1 NUT
M10 × 114 HEX BOLT, 2 WASHERS, 1 LOCKWASHER, 1 NUT
4 DIA. (#8) × 19 SLOTTED ROUND HEAD BOLT (STOVE BOLT), 2 WASHERS, 1 LOCKWASHER, 1 NUT
PLATFORM
BRACKET
102 × 102 WOODEN POST

SINGLE MAILBOX ASSEMBLY *



PLATFORM



BRACKET

NOTES:

GALVANIZE ALL MATERIALS PER AASHTO M 111.

STAKE MAILBOX LOCATIONS BEFORE INSTALLATION FOR PROPER HEIGHT AND DISTANCE FROM THE ROADWAY. ONCE STAKED, NOTIFY THE ENGINEER AND THE POST OFFICE. THE ENGINEER AND POSTMASTER/MAILCARRIER ARE ALLOWED 48 HOURS TO REVIEW AND MODIFY THE STAKED LOCATIONS PRIOR TO FINAL INSTALLATION.

* OTHER CRASH TESTED MAILBOX SUPPORTS AND ASSEMBLIES MAY ALSO BE USED.

LOCATE THE MAILBOX 0.2 TO 0.3 METERS OUTSIDE THE EDGE OF THE SHOULDER OR 0.15 TO 0.3 METERS FROM THE FACE OF CURB.

USE MAILBOXES MEETING THE REQUIREMENTS OF THE STANDARD SPECIFICATIONS.

SEE "A GUIDE TO MAILBOX SAFETY IN MONTANA", 1996 EDITION, FOR ADDITIONAL INFORMATION.

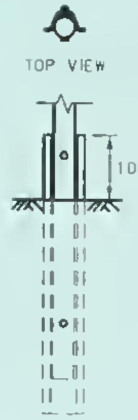
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC. SECTION
DWG. NO.
900-05

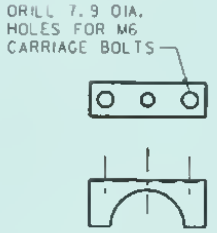
MAILBOX DETAIL

EFFECTIVE: AUGUST 1999

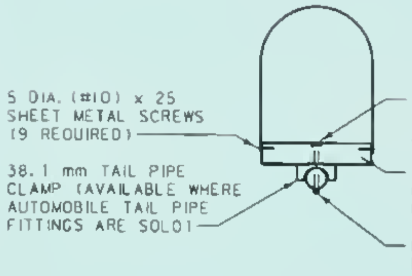
MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



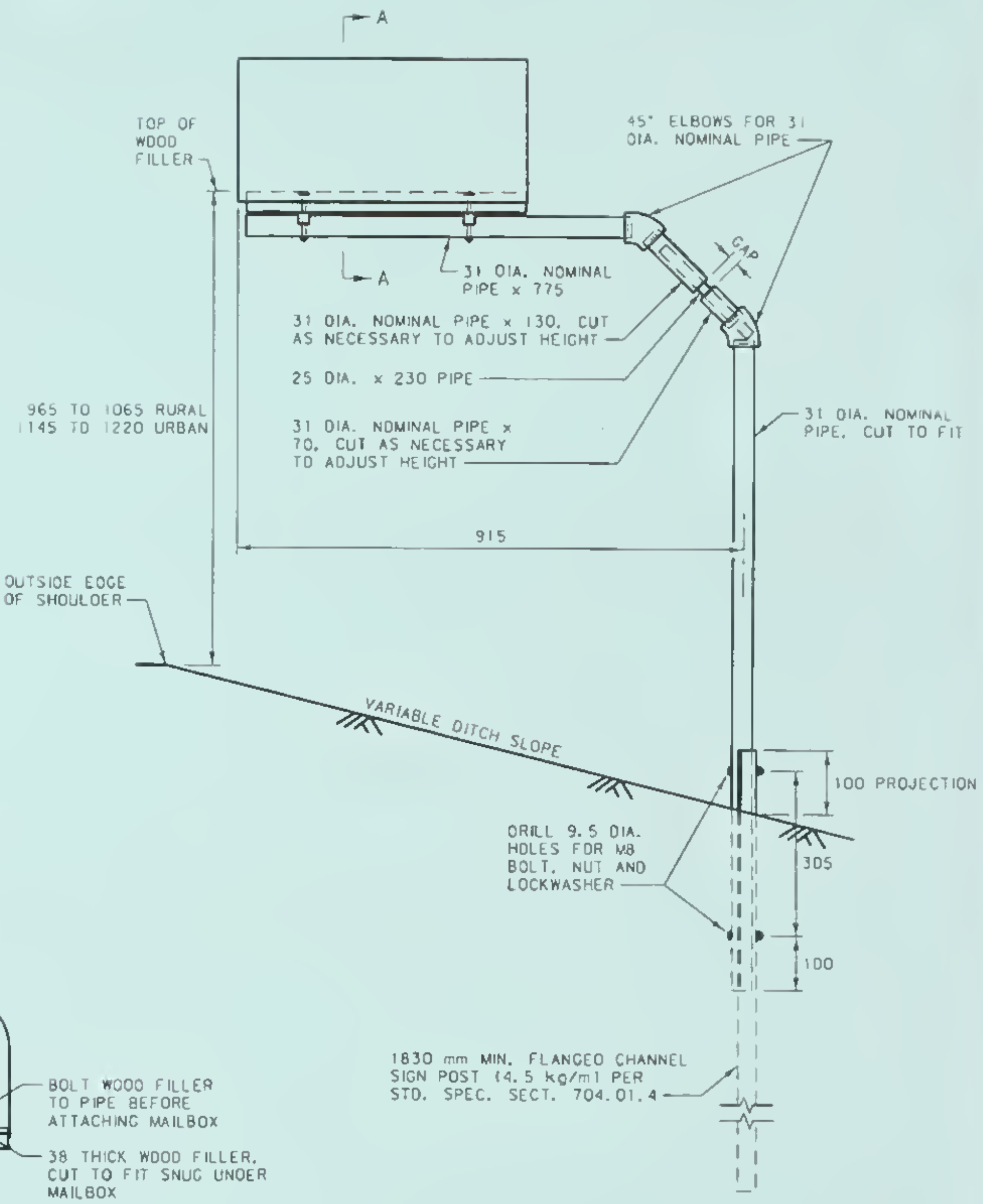
PIPE/POST CONNECTION
ROADWAY VIEW



TAIL PIPE CLAMP


5 DIA. (#10) × 25 SHEET METAL SCREWS (9 REQUIRED)
38.1 mm TAIL PIPE CLAMP (AVAILABLE WHERE AUTOMOBILE TAIL PIPE FITTINGS ARE SOLD)
BOLT WOOD FILLER TO PIPE BEFORE ATTACHING MAILBOX
38 THICK WOOD FILLER, CUT TO FIT SNUG UNDER MAILBOX
M6 × 102 CARRIAGE BOLTS AND NUTS

SECTION A-A


A
TOP OF WOOD FILLER
45° ELBOWS FOR 31 DIA. NOMINAL PIPE
GAP
A
31 DIA. NOMINAL PIPE × 775
31 DIA. NOMINAL PIPE × 130, CUT AS NECESSARY TO ADJUST HEIGHT
25 DIA. × 230 PIPE
965 TO 1065 RURAL
1145 TO 1220 URBAN
31 DIA. NOMINAL PIPE × 70, CUT AS NECESSARY TO ADJUST HEIGHT
31 DIA. NOMINAL PIPE, CUT TO FIT
915
OUTSIDE EDGE OF SHOULDER
VARIABLE DITCH SLOPE
100 PROJECTION
DRILL 9.5 DIA. HOLES FOR M8 BOLT, NUT AND LOCKWASHER
305
100
1830 mm MIN. FLANGED CHANNEL SIGN POST (4.5 kg/m) PER STD. SPEC. SECT. 704.01.4

MAILBOX SUPPORT
STEEL PIPE WITH FITTINGS AND STEEL FENCE POST

NOTES:

GALVANIZE ALL MATERIALS PER AASHTO M 111.

STAKE MAILBOX LOCATIONS BEFORE INSTALLATION FOR PROPER HEIGHT AND DISTANCE FROM THE ROADWAY. ONCE STAKED, NOTIFY THE ENGINEER AND THE POST OFFICE. THE ENGINEER AND POSTMASTER/MAILCARRIER ARE ALLOWED 48 HOURS TO REVIEW AND MODIFY THE STAKED LOCATIONS PRIOR TO FINAL INSTALLATION.

OTHER CRASH TESTED MAILBOX SUPPORTS AND ASSEMBLIES MAY ALSO BE USED.

LOCATE THE MAILBOX 0.2 TO 0.3 METERS OUTSIDE THE EDGE OF THE SHOULDER OR 0.15 TO 0.3 METERS FROM THE FACE OF CURB.

USE MAILBOXES MEETING THE REQUIREMENTS OF THE STANDARD SPECIFICATIONS.

SEE "A GUIDE TO MAILBOX SAFETY IN MONTANA", 1996 EDITION, FOR ADDITIONAL INFORMATION.

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC. SECTION
DWG. NO.
900-10

OPTIONAL MAILBOX DETAIL

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MONTANA CADD

REVISED

DETAILED DRAWINGS

ENGLISH EDITION

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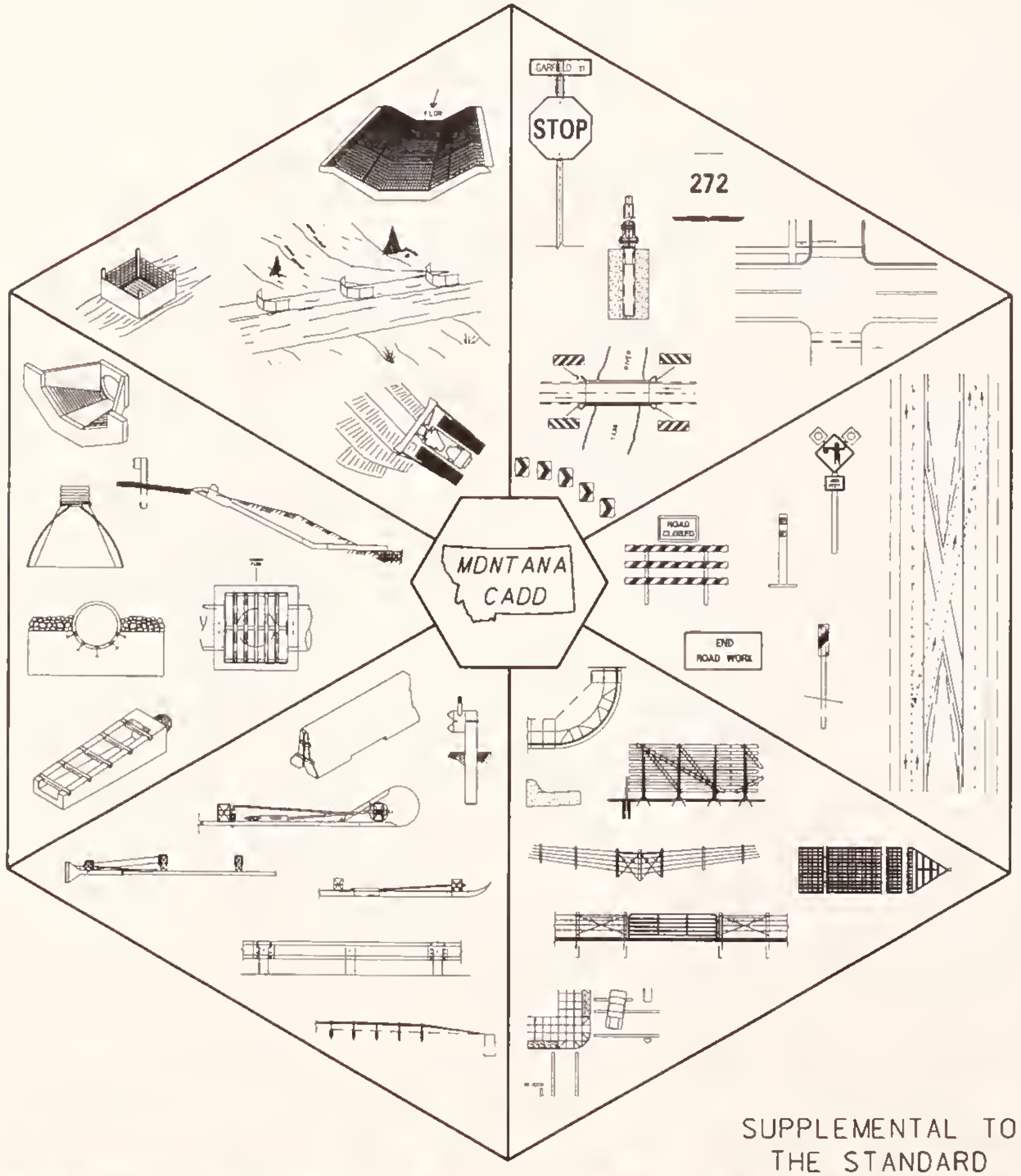

SUPPLEMENTAL TO
THE STANDARD
SPECIFICATIONS FOR
ROAD AND BRIDGE
CONSTRUCTION

MONTANA DEPARTMENT
OF TRANSPORTATION

DETAILED DRAWINGS

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A.A.D.T.	ANNUAL AVERAGE DAILY TRAFFIC
AASHTO	AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS
AB.	ABRUPT
A.C.	ALUMINUM CAP OR ASPHALT CEMENT
ADD. EXC.	ADDITIONAL EXCAVATION
ADJ.	ADJUSTED
A.D.T.	AVERAGE DAILY TRAFFIC
AGG.	AGGREGATE
AH.	AHEAD
ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE
APP.	APPROACH
APPL.	APPLICATION
APPROX.	APPROXIMATE
ASPH.	ASPHALT
ASTM	AMERICAN SOCIETY FOR TESTING & MATERIALS
AVE.	AVENUE
AVG.	AVERAGE
AZ.	AZIMUTH
BAL.	BALANCE
BBL.	BARREL
B.C.	BRASS CAP
B.C.R.	BEGIN CURB RETURN
B.E.	BRIDGE END
BEG.	BEGIN
BIT.	BITUMINOUS OR BITUMEN
BK.	BACK OR BANK
BLDG.	BUILDING
BLK.	BLOCK
B.L.M.	U.S. BUREAU OF LAND MANAGEMENT
BLVD.	BOULEVARD
B.M.	BENCH MARK
BNDRY.	BOUNDARY
BOT.	BOTTOM
BR.	BRIDGE
B.R.	BASE OF RAIL
BRG.	BEARING
B.S.	BACKSIGHT
B.S.T.	BITUMINOUS SURFACE TREATMENT
B.W.FE.	BARBED WIRE FENCE
C	CUT
C/A	CONTROL OF ACCESS
CALC.	CALCULATED
CAP	CORRUGATED ALUMINUM PIPE
CATV	CABLE TV
CB.	CURB
C.B.	CATCH BASIN
C.B.W.	CONCRETE BLOCK WALL
C.C.	CLOSING CORNER
CDTN.	CONDITION
CEM.	CEMENT
C&G	CURB & GUTTER
CH.	CHANNEL OR CHAIN
CH.CH.	CHANNEL CHANGE
CHD.	CHORD
CHIS. "x"	CHISELED CROSS
C.I.	CURB INLET
CIR.	CIRCLE
CL.	CLASS OR CLEARANCE
CL-4F.5F	CHAIN LINK FENCE (W/ HEIGHT)
C/L OR ℄	CENTERLINE
CMP	CORRUGATED METAL PIPE
C.N.	CONCRETE NAIL
CO.	COUNTY OR COMPANY
C.O.	CLEAN OUT
COMP.	COMPACTION
CONC.	CONCRETE
COND. (TEL.)	CONDUIT (SPECIFY TYPE)
CONN.	CONNECTION
CONST.	CONSTRUCTION
COR.	CORNER
CORR.	CORRECTED OR CORRUGATION
COV.	COVER
C.P.	CATCH POINT
CR.	CRUSHED OR CREEK
CRS.	COURSE
CS	CURVE TO SPIRAL
C.S.F.	COMBINATION SCALE FACTOR
CSP	CORRUGATED STEEL PIPE
CSPA	CORRUGATED STEEL PIPE ARCH
CT.	COURT
C.T.B.	CEMENT TREATED BASE
CTR.	CENTER
CTS	CRUSHED TOP SURFACING
CULV.	CULVERT
C.Y.	CUBIC YARD
D	DEGREE OF CURVATURE OR DISTRIBUTION OF TRAFFIC
DBL.	DOUBLE
D_c	DEGREE OF CURVATURE (WITH SPIRALS)
D.D.	DOWN DRAIN
DE	DIFFERENCE IN ELEVATION
DEFL.	DEFLECTION
DESC.	DESCRIPTION
DEST.	DESTROYED
DET.	DETOUR OR DETAIL
DETC.	DETECTOR
D.H.	DRILL HOLE
D.H.V.	DESIGN HOURLY VOLUME
D.I.	DROP INLET
DIA.	DIAMETER
DIST.	DISTANCE OR DISTRICT
DN.	DOWN
DP.	DEEP
DR.	DRAIN OR DRIVE
DT.	DITCH
DTL.	DETAILED
DWG.	DRAWING
DY.	DAYLIGHT
E	EAST OR EXTERNAL DISTANCE
EB	EASTBOUND
E.C.R.	END CURB RETURN
EDM	ELECTRONIC DISTANCE MEASUREMENT
E.G.	EDGE OF GUTTER
ELEV. OR EL.	ELEVATION
ELONG.	ELONGATED
ELY.	EASTERLY
EMB.	EMBANKMENT
EMUL.	EMULSIFIED
E.O.	EDGE OF OIL
E.P.	EDGE OF PAVEMENT
EQ.	EQUATION
E_t	EXTERNAL DISTANCE (WITH SPIRALS)
E.S.	EDGE OF SHOULDER
ESMT. OR EASE.	EASEMENT
ETW	EDGE OF TRAVELED WAY
EW.	END WALL
EX.	EXISTING
EXC.	EXCAVATION
EXT.	EXTENSION
EXWY.	EXPRESSWAY
F	FILL
F.A.	FEDERAL AID
F.C.	FLOOD CONTROL
FD.	FOUND
FDN.	FOUNDATION
FE.	FENCE

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
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ABBREVIATIONS

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MONTANA DEPARTMENT OF TRANSPORTATION
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FERT.	FERTILIZER
FETS	FLARED END TERMINAL SECTION
F.G.	FINISHED GRADE
F.G.S.	FINISHED GRADE STAKE
F.H.	FIRE HYDRANT
FIN.	FINISH
FL.	FLUSH
F.L.	FLOW LINE
F.O.	FIBER OPTIC CABLE
F.P.	FENCE POST
FR. RD.	FRONTAGE ROAD
F.S.	FORESIGHT
FT.	FOOT
FTG.	FOOTING
FUT.	FUTURE
FWY.	FREEWAY
G	GRADING
GA.	GAGE
GAL.	GALLON
GALV.	GALVANIZED
GAR.	GARAGE
GEOD.	GEODETIC
G.L.	GAS LINE
G.L.O.	GENERAL LAND OFFICE
GPS	GLOBAL POSITIONING SYSTEM
GR.	GRADE
G.R.	GUARDRAIL
GRND.	GROUND
GR. SEP.	GRADE SEPARATION
G.S.	GRAVEL SURFACING
GSP	GALVANIZED STEEL PIPE
GTR.	GUTTER
G.V.	GAS VALVE
HDWL	HEADWALL
HG.	HEADGATE
H.I.	HEIGHT OF INSTRUMENT
HO.	HOUSE
HOR.	HORIZONTAL
H.P.	HINGE POINT
HT.	HEIGHT
H&T	HUB & TACK
H.W.	HIGH WATER
HWY.	HIGHWAY
I	INTERSTATE
I.C.	INCIDENTAL CONSTRUCTION
I.D.	INSIDE DIAMETER
I.E.	INVERT ELEVATION
INC.	INCORPORATED OR INCREMENT
INCL.	INCLUDED
INSTR.	INSTRUMENT
INT.	INTERSECTION
INTCH.	INTERCHANGE
INV.	INVERT
I.P.	IRON PIN
IRR.	IRRIGATION
I.R.T.S.	INTERSECTING ROADWAY TERMINAL SECTION
JCT.	JUNCTION
J.P.	JOINT USE POLE
L	LENGTH OF CURVE OR ANGLE IRON
LB.	POUND
L_c	LENGTH OF CIRCULAR CURVE
L.C.	LONG CHORD
L.D.	LOOP DETECTOR
LENG.	LENGTH OR LENGTHEN
L.F.	LINEAR FOOT
LN.	LANE
L_s	LENGTH OF SPIRAL
L.S.	LAND SURVEYOR
LT.	LEFT
MATL.	MATERIAL
MAX.	MAXIMUM
MC	MEDIUM CURING
MEAS.	MEASURED
MED.	MEDIAN
MH.	MANHOLE
MIN.	MINIMUM, MINERAL OR MINUTE
MISC.	MISCELLANEOUS
MKR.	MARKER
M.L.	MAINLINE
MNCPL.	MUNICIPAL
M.O.	MID ORDINATE
MON.	MONUMENT
MPC	MID-POINT OF CURVE
M.Y.	MILE YARD
N	NORTH
NB	NORTHBOUND
N.C.	NORMAL CROWN
N.E.	NORTHEAST
N.G.	NATURAL GAS
N.G.S.	NATIONAL GEODETIC SURVEY
NL.	NAIL
NLY.	NORTHERLY
NO. OR #	NUMBER
N.W.	NORTHWEST
N.W.EL.	NORMAL WATER ELEVATION
O. OR O/S	OFFSET
O.C.	ON CENTERS OR OVERHEAD CROSSING
O.D.	OUTSIDE DIAMETER
O.G.	OLD GROUND OR ORIGINAL GROUND
OH.	OVERHANG OR OVERHEAD
O'PASS	OVERPASS
P	POWER CABLE OR PIPE
P. OR PG.	PAGE
PAVT.	PAVEMENT
P.B.	PULL BOX
PC	POINT OF CURVE (BEGINNING)
PCC	POINT OF COMPOUND CURVE OR PORTLAND CEMENT CONCRETE
P.C.S.	PROJECT CONTROL SYSTEM
P.E.	PRELIMINARY ENGINEERING
PEN.	PENETRATION
PERF.	PERFORATED
PI	POINT OF INTERSECTION
PL.	PLACE, PLATE OR PLANT
P.L.	PROPERTY LINE
PLAS.	PLASTIC
P.M.	PRINCIPAL MERIDIAN OR PUNCH MARK
P.M.B.	PLANT MIX BASE
P.M.P.	PERFORATED METAL PIPE
PMS	PLANT MIX SURFACING
PMT.	PERMIT
POC	POINT ON CURVE
POL	POINT ON LINE
POS	POINT ON SPIRAL
POST	POINT ON SEMI-TANGENT
POT	POINT ON TANGENT
POVC	POINT ON VERTICAL CURVE
PP	POWER POLE
PP.	PAGES
PREST.	PRESTRESSED
PRIM.	PRIMARY
PROC.	PROCESSING
PROJ.	PROJECT OR PROJECTED

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 101
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ABBREVIATIONS

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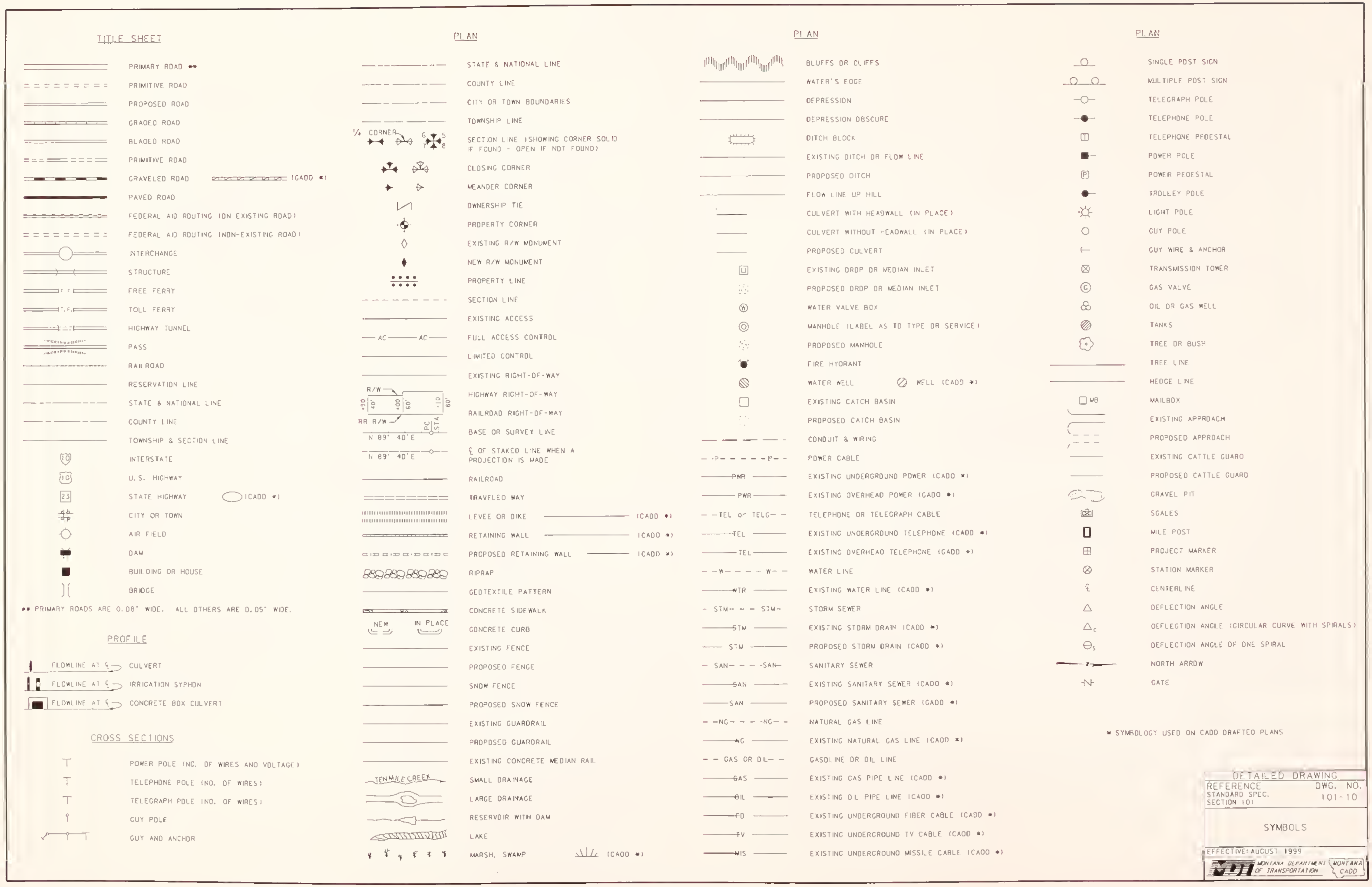
PROT.	PROTECT, PROTECTOR OR PROTECTION
PT	POINT OF TANGENT (END OF CURVE)
PT.	POINT
PTW	PRESENT TRAVELED WAY
PVC	POLYVINYL CHLORIDE
PVT.	PRIVATE
PWR.	POWER (LINES)
Q	PEAK DISCHARGE (WATER)
QTY.	QUANTITY
R	RANGE, RADIUS OR RISE
RACET	ROAD APPROACH CULVERT END TREATMENT
RAD. PT.	RADIUS POINT
R_c	SPIRAL CURVE RADIUS
RC	RAPID CURING
RCB	REINFORCED CONCRETE BOX
RCP	REINFORCED CONCRETE PIPE
RCPA	REINFORCED CONCRETE PIPE ARCH
RD.	ROAD
RDL.	RADIAL
RDWY.	ROADWAY
REC.	RECORD
REF.	REFERENCE
REINF.	REINFORCEMENT
RET. W.	RETAINING WALL
RIV.	RIVER
R. M.	REFERENCE MONUMENT
R. P.	REFERENCE POINT
R. R.	RAILROAD
RT.	RIGHT OR ROUTE
RTE.	ROUTE
R/W	RIGHT OF WAY
RY.	RAILWAY
S	RATE OF FULL SUPERELEVATION, SLOPE IN FT. PER FT., SPAN OR SOUTH
SA.	SATELLITE (FOR TRAVERSE USE)
SAN.	SANITARY SEWER
SB	SOUTHBOUND
SC	SPIRAL TO CURVE OR SLOW CURING
SCH.	SCHEDULE
SDWK.	SIDEWALK
S. E.	SOUTHEAST
SEC.	SECTION, SECOND OR SECONDARY
SEL.	SELECT
S.G. OR SUBGR.	SUBGRADE
SH.	SHOULDER
SHT.	SHEET
SING.	SINGLE
SIP.	SIPHON
S. L. D.	SEA LEVEL DATUM
SLOT. DR.	SLOTTED DRAIN
SLP. STK.	SLOPE STAKE
SLY.	SOUTHERLY
S. P.	STAND PIPE OR STATE PLANE
SPEC. PROV.	SPECIAL PROVISION
S. P. H. P.	STEEL PIPE, HIGH PRESSURE
SPK.	SPIKE
SQ.	SQUARE
SS	EMULSIFIED ASPHALT
SSPP	STRUCTURAL STEEL PLATE PIPE
SSPPA	STRUCTURAL STEEL PLATE PIPE ARCH
ST	SPIRAL TO TANGENT
ST.	STREET
STA.	STATION
STD.	STANDARD
SPEC.	SPECIFICATION
STK.	STAKED OR STAKE
STL.	STEEL
STM.	STORM DRAIN
STPD.	STAMPED
STR.	STRUCTURE OR STRAIGHT
SUBD.	SUBDIVISION
SURF.	SURFACE OR SURFACING
SURV.	SURVEY
S. W.	SOUTHWEST OR SIDEWALK
S. Y.	SQUARE YARD
T	TOWNSHIP, TANGENT LENGTH OR PERCENT TRUCKS
TAN.	TANGENT
T. B. C.	TOP BACK OF CURB
T. B. M.	TEMPORARY BENCH MARK
TBR.	TIMBER
TEL.	TELEPHONE
TEL. C.	TELEPHONE CABLE
TELG.	TELEGRAPH
TEL. P.	TELEPHONE POLE
TEMP.	TEMPERATURE OR TEMPORARY
THK.	THICKNESS
TK.	TACK
TOPOG.	TOPOGRAPHIC
T. P.	TURNING POINT
TR.	TRACT
TRANS.	TRANSMISSION LINE OR TRANSITION
TRAV.	TRAVERSE
TRIA.	TRIANGULATION
T_s	LENGTH OF TANGENT (CURVE WITH SPIRALS)
TS	TANGENT TO SPIRAL
TT	TRANSMISSION TOWER
TYP.	TYPICAL
U	UNIT
U. G.	UNDERGROUND
UNCL.	UNCLASSIFIED
U' PASS	UNDERPASS
U. S. C. & G. S.	U. S. COAST & GEODETIC SURVEY
U. S. C. E.	U. S. CORPS OF ENGINEERS
U. S. F. S.	U. S. FOREST SERVICE
U. S. G. S.	U. S. GEOLOGICAL SURVEY
U. S. P. L. S.	U. S. PUBLIC LAND SURVEY
V	DESIGN SPEED OR VELOCITY
V. A. B. M.	VERTICAL ANGLE BENCH MARK
VC	VERTICAL CURVE
VC CORR.	VERTICAL CURVE OFFSET CORRECTION
V. C. M.	VERTICAL CONTROL MONUMENT
V. C. P.	VITRIFIED CLAY PIPE
VEH.	VEHICULAR
VERT. OR VT.	VERTICAL
VIT.	VITRIFIED
V. P.	VENT PIPE
VPC	VERTICAL POINT OF CURVE
VPI	VERTICAL POINT OF INTERSECTION
VPT	VERTICAL POINT OF TANGENCY
W	WEST
W/	WITH
WB	WESTBOUND
W. C.	WITNESS CORNER
W. L.	WATER LINE
WLY.	WESTERLY
W/O	WITHOUT
W. P.	WING POINT
W. S.	WATER SERVICE OR WARPED OR VARIABLE SLOPE
WT.	WEIGHT
W. T.	WATER TABLE
W. V.	WATER VALVE
W. W.	WING WALL OR WOVEN WIRE
XING.	CROSSING
XSEC.	CROSS-SECTION

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 101
DWG. NO.
101-07

ABBREVIATIONS

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



TITLE SHEET

- PRIMARY ROAD **
- PRIMITIVE ROAD
- PROPOSED ROAD
- GRADED ROAD
- BLADED ROAD
- PRIMITIVE ROAD
- GRAVELED ROAD (CADD *)
- PAVED ROAD
- FEDERAL AID ROUTING (ON EXISTING ROAD)
- FEDERAL AID ROUTING (NON-EXISTING ROAD)
- INTERCHANGE
- STRUCTURE
- FREE FERRY
- TOLL FERRY
- HIGHWAY TUNNEL
- PASS
- RAILROAD
- RESERVATION LINE
- STATE & NATIONAL LINE
- COUNTY LINE
- TOWNSHIP & SECTION LINE
- INTERSTATE
- U. S. HIGHWAY
- STATE HIGHWAY (CADD *)
- CITY OR TOWN
- AIR FIELD
- DAM
- BUILDING OR HOUSE
- BRIDGE

** PRIMARY ROADS ARE 0.08" WIDE. ALL OTHERS ARE 0.05" WIDE.

PROFILE

- FLOWLINE AT ℄ CULVERT
- FLOWLINE AT ℄ IRRIGATION SYPHON
- FLOWLINE AT ℄ CONCRETE BOX CULVERT

CROSS SECTIONS

- POWER POLE (NO. OF WIRES AND VOLTAGE)
- TELEPHONE POLE (NO. OF WIRES)
- TELEGRAPH POLE (NO. OF WIRES)
- GUY POLE
- GUY AND ANCHOR

PLAN

- STATE & NATIONAL LINE
- COUNTY LINE
- CITY OR TOWN BOUNDARIES
- TOWNSHIP LINE
- SECTION LINE (SHOWING CORNER SOLID IF FOUND - OPEN IF NOT FOUND)
- CLOSING CORNER
- MEANDER CORNER
- OWNERSHIP TIE
- PROPERTY CORNER
- EXISTING R/W MONUMENT
- NEW R/W MONUMENT
- PROPERTY LINE
- SECTION LINE
- EXISTING ACCESS
- FULL ACCESS CONTROL
- LIMITED CONTROL
- EXISTING RIGHT-OF-WAY
- HIGHWAY RIGHT-OF-WAY
- RAILROAD RIGHT-OF-WAY
- BASE OR SURVEY LINE
- ℄ OF STAKED LINE WHEN A PROJECTION IS MADE
- RAILROAD
- TRAVELED WAY
- LEVEE OR DIKE (CADD *)
- RETAINING WALL (CADD *)
- PROPOSED RETAINING WALL (CADD *)
- RIPRAP
- GEOTEXTILE PATTERN
- CONCRETE SIDEWALK
- CONCRETE CURB
- EXISTING FENCE
- PROPOSED FENCE
- SNOW FENCE
- PROPOSED SNOW FENCE
- EXISTING GUARDRAIL
- PROPOSED GUARDRAIL
- EXISTING CONCRETE MEDIAN RAIL
- SMALL DRAINAGE
- LARGE DRAINAGE
- RESERVOIR WITH DAM
- LAKE
- MARSH, SWAMP (CADD *)

PLAN

- BLUFFS OR CLIFFS
- WATER'S EDGE
- DEPRESSION
- DEPRESSION OBSCURE
- DITCH BLOCK
- EXISTING DITCH OR FLOW LINE
- PROPOSED DITCH
- FLOW LINE UP HILL
- CULVERT WITH HEADWALL (IN PLACE)
- CULVERT WITHOUT HEADWALL (IN PLACE)
- PROPOSED CULVERT
- EXISTING DROP OR MEDIAN INLET
- PROPOSED DROP OR MEDIAN INLET
- WATER VALVE BOX
- MANHOLE (LABEL AS TO TYPE OR SERVICE)
- PROPOSED MANHOLE
- FIRE HYDRANT
- WATER WELL — WELL (CADD *)
- EXISTING CATCH BASIN
- PROPOSED CATCH BASIN
- CONDUIT & WIRING
- POWER CABLE
- EXISTING UNDERGROUND POWER (CADD *)
- EXISTING OVERHEAD POWER (CADD *)
- TELEPHONE OR TELEGRAPH CABLE
- EXISTING UNDERGROUND TELEPHONE (CADD *)
- EXISTING OVERHEAD TELEPHONE (CADD *)
- WATER LINE
- EXISTING WATER LINE (CADD *)
- STORM SEWER
- EXISTING STORM DRAIN (CADD *)
- PROPOSED STORM DRAIN (CADD *)
- SANITARY SEWER
- EXISTING SANITARY SEWER (CADD *)
- PROPOSED SANITARY SEWER (CADD *)
- NATURAL GAS LINE
- EXISTING NATURAL GAS LINE (CADD *)
- GASOLINE OR OIL LINE
- EXISTING GAS PIPE LINE (CADD *)
- EXISTING OIL PIPE LINE (CADD *)
- EXISTING UNDERGROUND FIBER CABLE (CADD *)
- EXISTING UNDERGROUND TV CABLE (CADD *)
- EXISTING UNDERGROUND MISSILE CABLE (CADD *)

PLAN

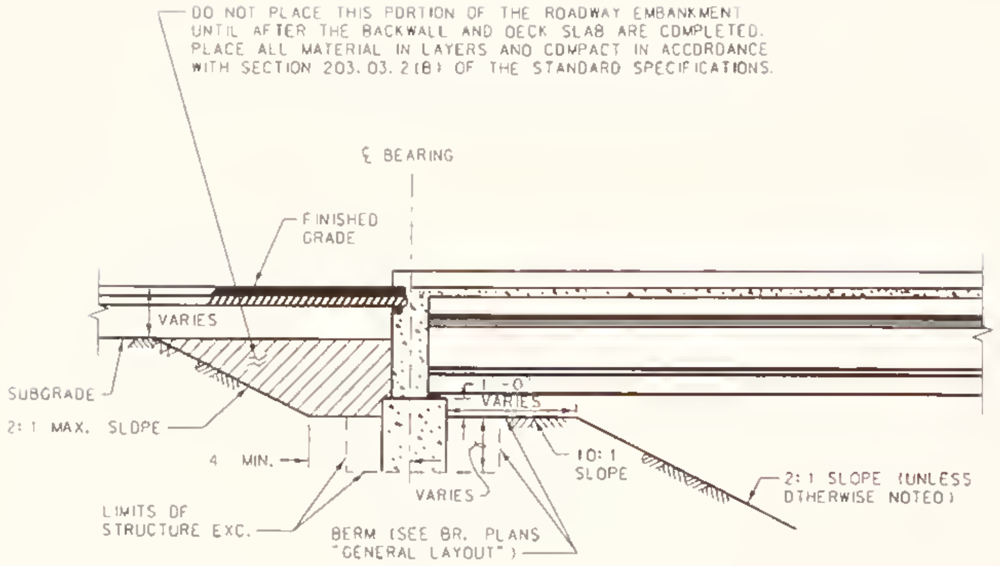
- SINGLE POST SIGN
- MULTIPLE POST SIGN
- TELEGRAPH POLE
- TELEPHONE POLE
- TELEPHONE PEDESTAL
- POWER POLE
- POWER PEDESTAL
- TROLLEY POLE
- LIGHT POLE
- GUY POLE
- GUY WIRE & ANCHOR
- TRANSMISSION TOWER
- GAS VALVE
- OIL OR GAS WELL
- TANKS
- TREE OR BUSH
- TREE LINE
- HEDGE LINE
- MAILBOX
- EXISTING APPROACH
- PROPOSED APPROACH
- EXISTING CATTLE GUARD
- PROPOSED CATTLE GUARD
- GRAVEL PIT
- SCALES
- MILE POST
- PROJECT MARKER
- STATION MARKER
- CENTERLINE
- DEFLECTION ANGLE
- DEFLECTION ANGLE (CIRCULAR CURVE WITH SPIRALS)
- DEFLECTION ANGLE OF ONE SPIRAL
- NORTH ARROW
- GATE

* SYMBOLOGY USED ON CADD DRAFTED PLANS

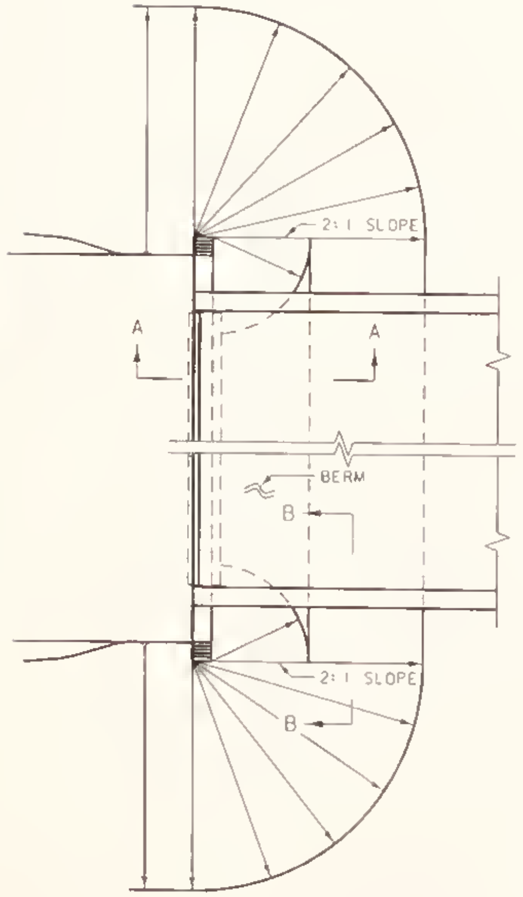
DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 101
DWG. NO.
101-10

SYMBOLS

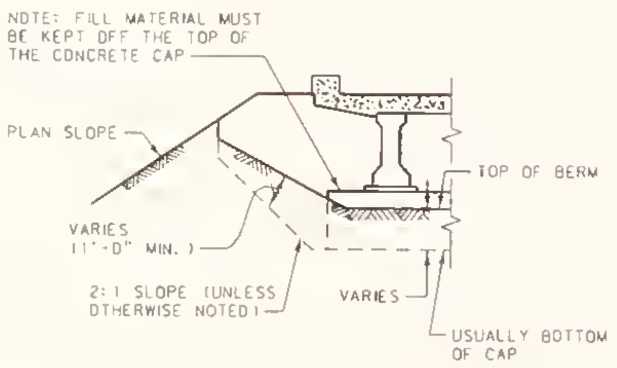
EFFECTIVE: AUGUST 1999
MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD


DO NOT PLACE THIS PORTION OF THE ROADWAY EMBANKMENT UNTIL AFTER THE BACKWALL AND DECK SLAB ARE COMPLETED. PLACE ALL MATERIAL IN LAYERS AND COMPACT IN ACCORDANCE WITH SECTION 203.03.2(B) OF THE STANDARD SPECIFICATIONS.
℄ BEARING
FINISHED GRADE
VARIES
SUBGRADE
2:1 MAX. SLOPE
4' MIN.
LIMITS OF STRUCTURE EXC.
1'-0"
VARIES
VARIES
10:1 SLOPE
2:1 SLOPE (UNLESS OTHERWISE NOTED)
BERM (SEE BR. PLANS "GENERAL LAYOUT")

SECTION A-A



PLAN VIEW


NOTE: FILL MATERIAL MUST BE KEPT OFF THE TOP OF THE CONCRETE CAP
PLAN SLOPE
TOP OF BERM
VARIES (1'-0" MIN.)
2:1 SLOPE (UNLESS OTHERWISE NOTED)
VARIES
USUALLY BOTTOM OF CAP

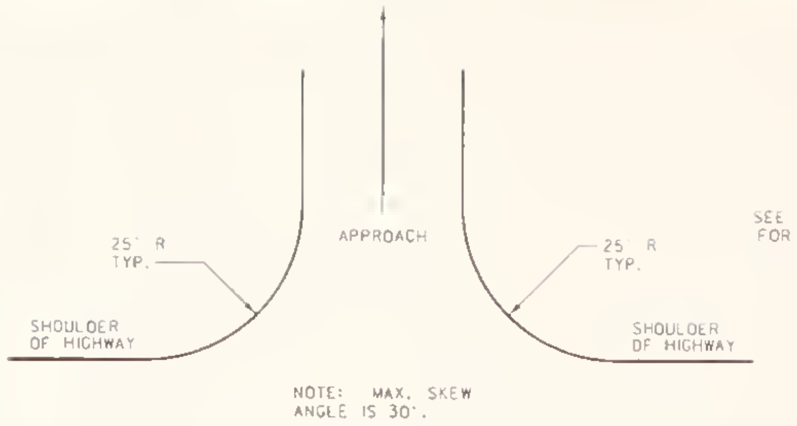
SECTION B-B

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 203
DWG. NO.
203-00

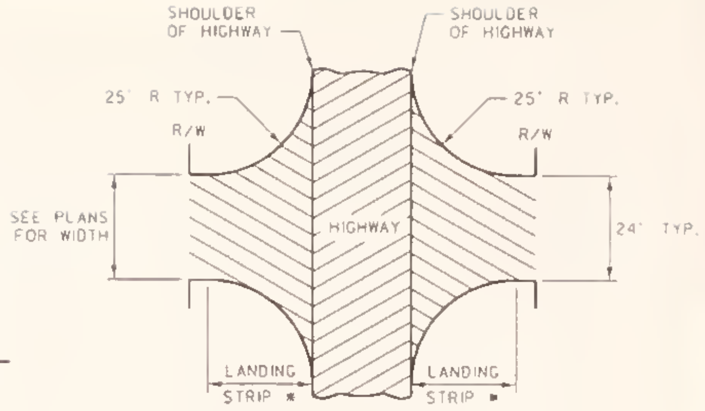
ROADWAY EMBANKMENT
AT BRIDGE END

EFFECTIVE: AUGUST 1999

MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

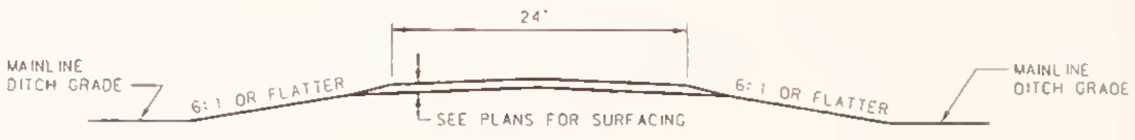


NOTE: MAX. SKEW ANGLE IS 30°.



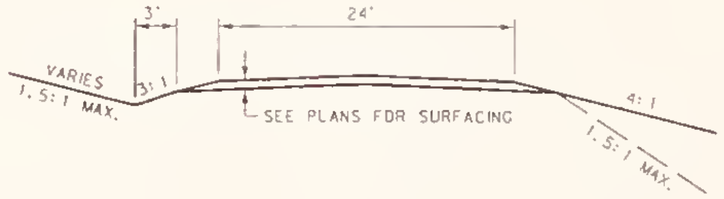
* 25.0' MIN. FOR PRIVATE OR FIELD APP.
75.0' MIN FOR COUNTY AND MAIN ROADS.

SLOPE FOR DRAINAGE (-3% DESIRABLE.
+3% ALLOWABLE).



TYPICAL SECTION WITHIN CLEAR ZONE

USE A PIPE AS NECESSARY FOR DRAINAGE.
INSTALL CULVERTS OUTSIDE THE CLEAR
ZONE OR PROVIDE END TREATMENT.



TYPICAL SECTION BEYOND CLEAR ZONE

BACK SLOPES **	
0'-5'	4:1
5'-10'	2:1
OVER 10'	1.5:1

FILL SLOPES **	
0'-10'	4:1
10'-20'	2:1
OVER 20'	1.5:1

NOTES:

APPROACH GRADE BEYOND LANDING IS NOT TO EXCEED 10% UNLESS TRAFFIC VOLUMES AND COST INDICATE SUCH TO BE JUSTIFIABLE.

CONSTRUCT APPROACHES TO FIT LOCAL CONDITIONS, MINIMIZE TRAFFIC HAZARDS, AND AFFORD ENTRY AND EXIT OF TRAFFIC TO AND FROM THE MAIN ROAD.

SECURE WRITTEN PERMISSION FROM LANDOWNER FOR WORK BEYOND THE RIGHT-OF-WAY.

** CRITERIA SHOWN ARE FOR PRIVATE AND FARM FIELD APPROACHES. FOR COUNTY AND MAIN ROADS USE ESTABLISHED STANDARDS FOR APPLICABLE FUNCTIONAL CLASS.

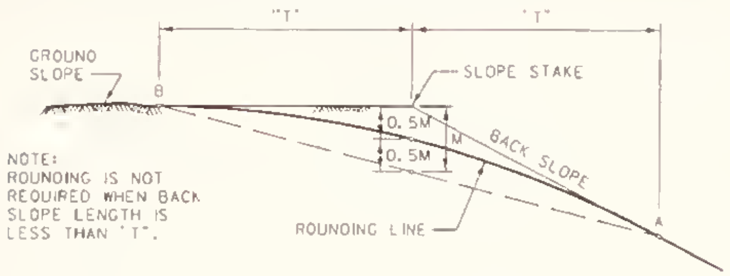
DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 203
DWG. NO.
203-05

APPROACHES

EFFECTIVE: AUGUST 1999

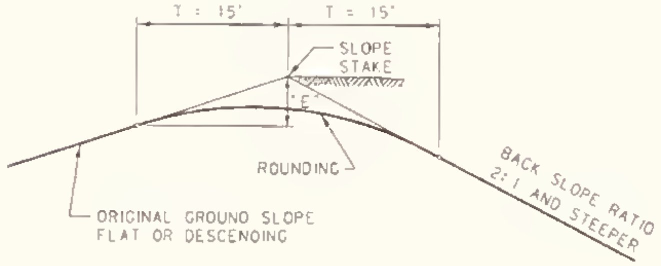
MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

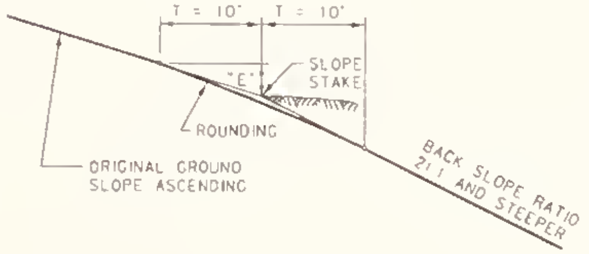
VERTICAL OFFSETS FROM ROADWAY AND GROUND SLOPES TO ROUNDING LINES FOR CUTS



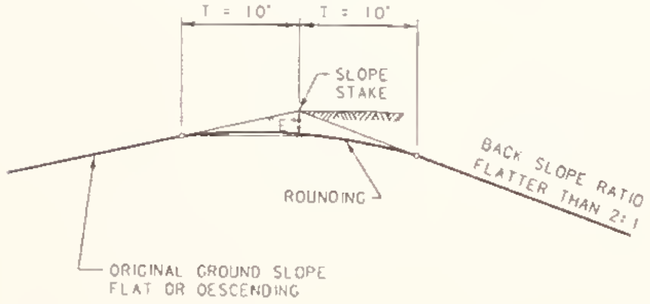
NOTE:
ROUNDING IS NOT REQUIRED WHEN BACK SLOPE LENGTH IS LESS THAN "T".

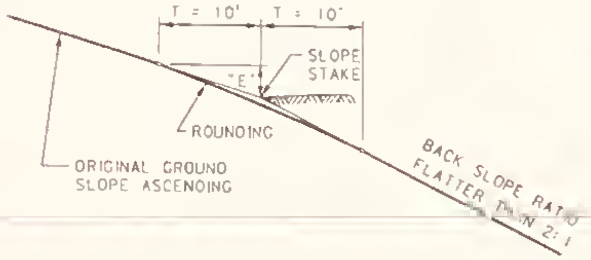
BACK SLOPES 2:1 AND STEEPER


T = 15'
T = 15'
SLOPE STAKE
"E"
ROUNDING
BACK SLOPE RATIO 2:1 AND STEEPER
ORIGINAL GROUND SLOPE FLAT OR DESCENDING


T = 10'
T = 10'
SLOPE STAKE
"E"
ROUNDING
ORIGINAL GROUND SLOPE ASCENDING
BACK SLOPE RATIO 2:1 AND STEEPER

BACK SLOPES FLATTER THAN 2:1


T = 10'
T = 10'
SLOPE STAKE
"E"
ROUNDING
BACK SLOPE RATIO FLATTER THAN 2:1
ORIGINAL GROUND SLOPE FLAT OR DESCENDING


T = 10'
T = 10'
SLOPE STAKE
"E"
ROUNDING
ORIGINAL GROUND SLOPE ASCENDING
BACK SLOPE RATIO FLATTER THAN 2:1

BACK SLOPES
2:1 AND STEEPER (T = 15')

VERT. DIST. "E" (FT.)	DESCENDING GROUND CUTS					
	0.5M (FT.)					
	0.75:1	1:1	1.25:1	1.5:1	1.75:1	2:1
FLAT	5.0	3.8	3.0	2.5	2.1	1.9
2.0	5.5	4.3	3.5	3.0	2.6	2.4
4.0	6.0	4.8	4.0	3.5	3.1	2.9
6.0	6.5	5.3	4.5	4.0	3.6	3.4
8.0	7.0	5.8	5.0	4.5	4.1	3.9
10.0	7.5	6.3	5.5	5.0	4.6	4.4
12.0	8.0	6.8	6.0	5.5	5.1	4.9
14.0	8.5	7.3	6.5	6.0	5.6	5.4
16.0	9.0	7.8	7.0	6.5	6.1	5.9

BACK SLOPES
2:1 AND STEEPER (T = 10')

VERT. DIST. "E" (FT.)	ASCENDING GROUND CUTS					
	0.5M (FT.)					
	0.75:1	1:1	1.25:1	1.5:1	1.75:1	2:1
FLAT	3.3	2.5	2.0	1.7	1.4	1.3
2.0	2.8	2.0	1.5	1.2	0.9	0.8
4.0	2.3	1.5	1.0	0.7	0.4	0.3
6.0	1.8	1.0	0.5	0.2	0.0	0.0
8.0	1.3	0.5	0.0	0.0	~	~
10.0	0.8	0.0	~	~	~	~
12.0	0.3	~	~	~	~	~
14.0	0.0	~	~	~	~	~

BACK SLOPES
FLATTER THAN 2:1 (T = 10')

VERT. DIST. "E" (FT.)	DESCENDING GROUND CUTS					
	0.5M (FT.)					
	2.5:1	3:1	3.5:1	4:1	5:1	6:1
FLAT	1.0	0.8	0.7	0.6	0.5	0.4
1.0	1.3	1.1	1.0	0.9	0.8	0.7
2.0	1.5	1.3	1.2	1.1	1.0	0.9
3.0	1.8	1.6	1.5	1.4	1.3	1.2
4.0	2.0	1.8	1.7	1.6	1.5	1.4
5.0	2.3	2.1	2.0	1.9	1.8	1.7
6.0	2.5	2.3	2.2	2.1	2.0	1.9
7.0	2.8	2.6	2.5	2.4	2.3	2.2
8.0	3.0	2.8	2.7	2.6	2.5	2.4
9.0	3.3	3.1	3.0	2.9	2.8	2.7
10.0	3.5	3.3	3.2	3.1	3.0	2.9

BACK SLOPES
FLATTER THAN 2:1 (T = 10')

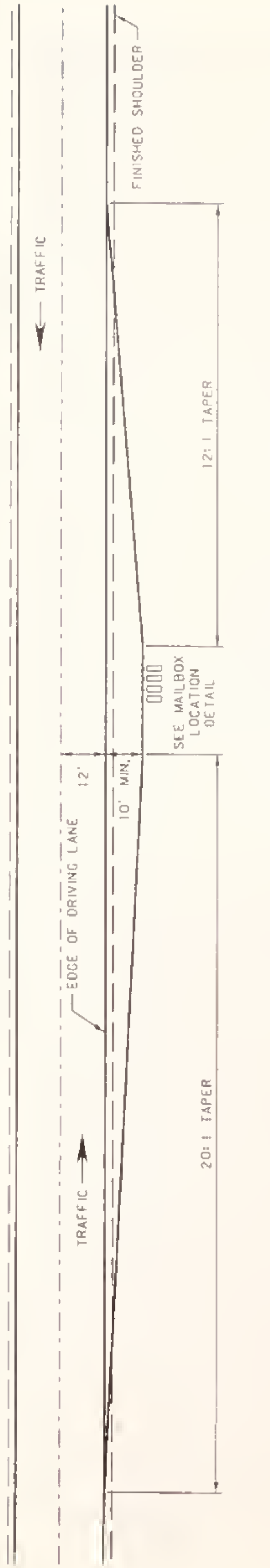
VERT. DIST. "E" (FT.)	ASCENDING GROUND CUTS					
	0.5M (FT.)					
	2.5:1	3:1	3.5:1	4:1	5:1	6:1
FLAT	1.0	0.8	0.7	0.6	0.5	0.4
1.0	0.8	0.6	0.5	0.4	0.3	0.2
2.0	0.5	0.3	0.2	0.1	0.0	0.0
3.0	0.3	0.0	0.0	0.0	~	~
4.0	0.0	~	~	~	~	~
5.0	~	~	~	~	~	~
6.0	~	~	~	~	~	~
7.0	~	~	~	~	~	~
8.0	~	~	~	~	~	~
9.0	~	~	~	~	~	~
10.0	~	~	~	~	~	~

DETAILED DRAWING
REFERENCE DWG. NO.
STANDARD SPEC. 203-10
SECTION 203

SLOPE ROUNDING

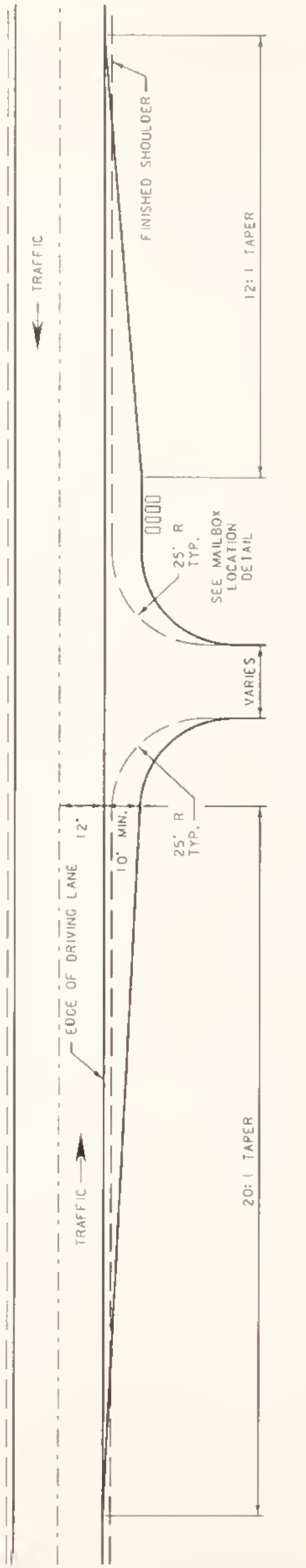
EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



TURNOUT WITHOUT APPROACH

NOTE:
ACTUAL SIZE AND LOCATION TO BE DETERMINED BY THE ENGINEER.



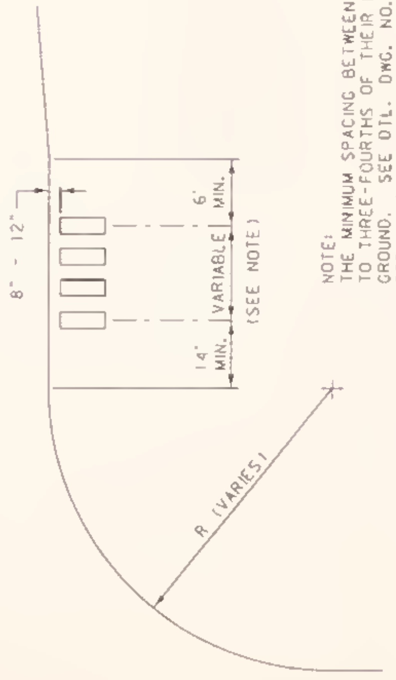
TURNOUT WITH APPROACH

NOTES:

LOCATE NEW INSTALLATIONS, IF POSSIBLE, ON THE FAR RIGHT SIDE OF AN INTERSECTION WITH A PUBLIC ROAD OR PRIVATE DRIVEWAY.

APPROACH QUANTITIES ARE NOT INCLUDED IN TURNOUT QUANTITIES.

USE THIS DETAIL FOR ALL ROADS AND ADT. FOR ADT LESS THAN 400, STEEPER TAPERS ARE ALLOWED IF NEEDED DUE TO LIMITATIONS. SEE THE "AASHTO GUIDE FOR ERECTING MAILBOXES ON HIGHWAYS."



NOTE:
THE MINIMUM SPACING BETWEEN MAILBOXES IS EQUAL TO THREE-FOURTHS OF THEIR HEIGHT ABOVE THE GROUND. SEE DTL. DWG. NO. 900-05 AND 900-10 FOR MAILBOX DETAILS.

MAILBOX LOCATION DETAIL

DETAILED DRAWING
REFERENCE DWG. NO.
STANDARD SPEC. 203-15
SECTION 203

MAILBOX TURNOUT

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

EROSION CONTROL SYMBOLS

BEST MANAGEMENT PRACTICE (BMP)	NAME	SYMBOL	DTL. DWG. NO.
SLOPE ROUGHENING	P-01	←(SR)→	208-05
STEPPED SLOPE	P-02	←(SS)→	208-07
TEMPORARY SEEDING	P-03	←(TS)→	208-10
EROSION SEEDING	P-04	←(ES)→	208-15
RUN-ON DIVERSION/CONTROL	P-05	←(RD)→	208-20
SLOPE DRAINS	P-06	←(SD)→	208-25
EROSION MAT	P-07	←(EM)→	208-30
DITCH SEDIMENT TRAPS	R-01	←(DT#)→	208-35
DUGOUT DITCH BASIN	R-02	←(DDB)→	208-40
GRAVEL FILTER BERM	R-03	←(GFB)→	208-45
SEDIMENT CONTROL FENCE	R-04	←(SCF)→	208-50
STRAW BALE BARRIER	R-05	←(SBB)→	208-55
VEGETATIVE BUFFER STRIP	R-06	←(VBS)→	208-60
RUNOFF INTERCEPTION DITCH	R-07	←(RID)→	208-65
PIPE INLET/OUTLET PROTECTION	R-08	(I/O)	208-70
WATERWAY PROTECTION	W-01	(WP)	208-75
WATER RESOURCE PROTECTION	W-02	←(WR)→	208-80

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 208
DWG. NO.
208-00

EROSION CONTROL
SYMBOLS

EFFECTIVE: AUGUST 1999

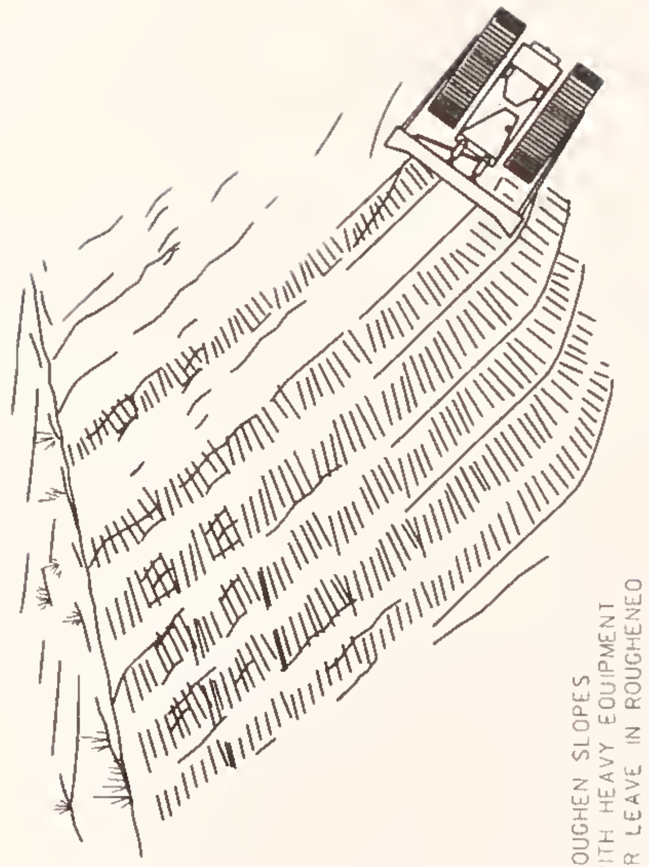
MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

SYMBOL: ←(SR)→

SLOPE ROUGHENING BMP P-01:

SLOPE ROUGHENING (SR) IS A VERY ROUGH SOIL SURFACE ON SLOPES RESULTING FROM CONSTRUCTION ACTIVITIES OR THE SYSTEMATIC ROUGHENING USING HEAVY EQUIPMENT TO CREATE RIDGES OR FURROWS PERPENDICULAR TO THE SLOPE. THE RIDGES OR FURROWS ARE TO BE EQUAL TO OR GREATER THAN 2 INCHES IN HEIGHT AND NO FURTHER THAN TWICE THE HEIGHT OF THE RIDGE OR FURROW APART. SLOPE ROUGHENING IS THE BEST FIRST LINE OF DEFENSE TO CONTROL EROSION AND SEDIMENT RUNOFF. DEGREE OF SLOPE ROUGHENING IS DEPENDENT ON THE GRADES AND PROXIMITY TO WATER RESOURCES.

ALL SLOPES STEEPER THAN 3:1 AND GREATER THAN 5 VERTICAL FEET REQUIRE SLOPE ROUGHENING. EXCLUDING ROCK SLOPES THAT CANNOT BE EXCAVATED BY RIPPING. ROUGHEN DISTURBED SLOPES OR LEAVE IN A ROUGHENED CONDITION. APPROPRIATE SUPPLEMENTS INCLUDE TEMPORARY SEEDING OR EROSION SEEDING. WHEN FILL SLOPES ARE WITHIN 50 FEET OF SURFACE WATER. A SEDIMENT RETENTION BMP IS REQUIRED: EITHER SEDIMENT CONTROL FENCES OR RUNOFF INTERCEPTION DITCHES.



ROUGHEN SLOPES
WITH HEAVY EQUIPMENT
OR LEAVE IN ROUGHENED
CONDITION

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 208
DWG. NO.
208-05

SLOPE ROUGHENING
(P-01)

EFFECTIVE: AUGUST 1999

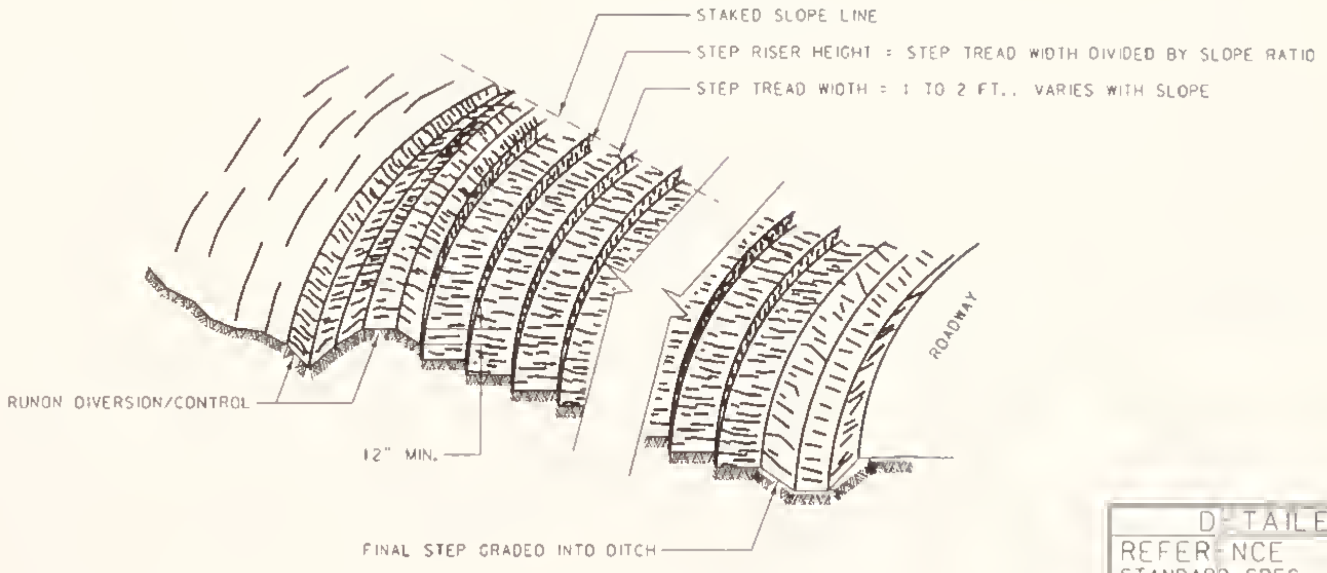
MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

SYMBOL: ——(SS)——

STEPPED SLOPE BMP P-02:

STEPPED SLOPE (SS) IS A VERY ROUGH SOIL SURFACE ON SLOPES WITH HORIZONTAL DEPRESSIONS/STAIR STEPPING CUTS OR TERRACES CREATED BY APPROPRIATE MACHINERY. THE USE OF THIS BMP IS TO BE DETERMINED BY THE ENGINEER.

WHEN POSSIBLE, HORIZONTALLY STEP ALL CUT SLOPES 2:1 AND STEEPER, EXCLUDING ROCK SLOPES THAT CANNOT BE EXCAVATED BY RIPPING. STEP SLOPES AT THE DISCRETION OF THE ENGINEER AND IN ACCORDANCE WITH MDT STANDARD SPECIFICATIONS 208 AND 203.03.1F.


STAKED SLOPE LINE
STEP RISER HEIGHT = STEP TREAD WIDTH DIVIDED BY SLOPE RATIO
STEP TREAD WIDTH = 1 TO 2 FT., VARIES WITH SLOPE
ROADWAY
RUNON DIVERSION/CONTROL
12" MIN.
FINAL STEP GRADED INTO DITCH

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 208
DWG. NO.
208-07

STEPPED SLOPE
(P-02)

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

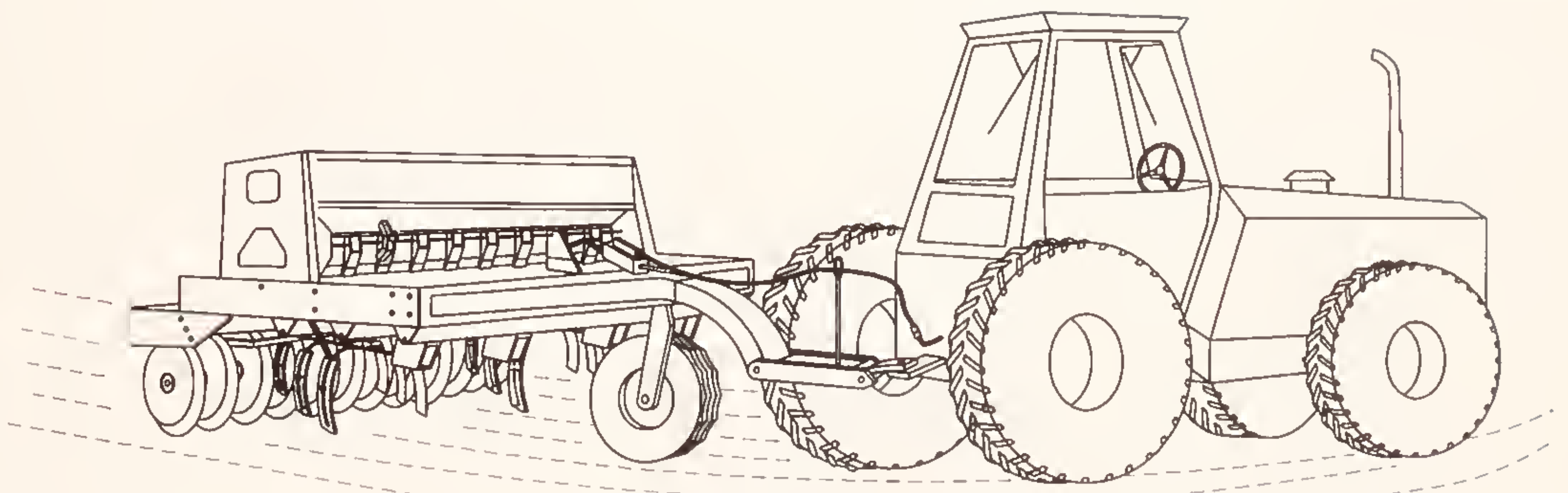
SYMBOL: ——(TS)——

TEMPORARY SEEDING BMP P-03:

TEMPORARY SEEDING (TS) IS THE ESTABLISHMENT OF A TEMPORARY VEGETATIVE COVER BY SEEDING WITH CEREAL BARLEY. USE TEMPORARY SEEDING ON AREAS 3:1 OR FLATTER THAT WILL BE EXPOSED FOR LONGER THAN 14 DAYS AND THAT WILL UNDERGO FURTHER DISTURBANCE, EXCLUDING ROCK SLOPES THAT CANNOT BE EXCAVATED BY RIPPING.

SEEDING DATES AND APPLICATION RATES ARE AS FOLLOWS:
APR. 1 TO JUN. 30: CEREAL BARLEY AT 12 LB./ACRE
JUL. 1 TO AUG. 31: TEMPORARY SEEDING NOT RECOMMENDED
SEP. 1 TO NOV. 15: CEREAL BARLEY AT 12 LB./ACRE (DO NOT TEMPORARY SEED IN THIS TIMEFRAME IF THE AREA IS TO BE PERMANENTLY SEEDED THAT FALL.)

CONTACT THE MDT AGRONOMIST PRIOR TO USING SUBSTITUTIONS OR PLACING TEMPORARY SEEDING OUTSIDE THESE DATES. DRILL SEED SLOPES OF 3:1 OR FLATTER. FOR SLOPES STEEPER THAN 3:1, REFER TO EROSION SEEDING.



SLOPES 3:1 OR FLATTER

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 208
DWG. NO.
208-10

TEMPORARY SEEDING
(P-03)

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

SYMBOL: ←(ES)→

EROSION SEEDING BMP P-04

EROSION SEEDING (ES) IS THE IMMEDIATE SEEDING OF FRESHLY EXPOSED SLOPES. USE EROSION SEEDING ON CUT AND FILL SLOPES STEEPER THAN 3:1 THAT WILL NOT UNDERGO FURTHER DISTURBANCE. EXCLUDING ROCK SLOPES THAT CANNOT BE EXCAVATED BY RIPPING. THIS SEEDING WILL NOT REPLACE OR SUBSTITUTE FOR FINAL SEEDING ACTIVITIES SPECIFIED IN THE SEEDING SPECIAL PROVISION.

SEED COMPLETED SECTIONS DAILY, REGARDLESS OF THE TIME OF YEAR. ACCOMPLISH SEEDING BY MANUAL BROADCASTING WITH A SHOULDER-HARNESSED SPREADER SEEDER OR ITS EQUIVALENT WITH NO MULCH OR FERTILIZER APPLIED. STORE THE RECOMMENDED SEED MIX ON-SITE PRIOR TO INITIATION OF SLOPE EXCAVATION. IF ONE OR MORE SPECIES IS UNAVAILABLE, CONTACT THE MDT AGRONOMIST FOR THE SUBSTITUTE. THE SEED MIX AND RATE OF APPLICATION ARE AS FOLLOWS:

DISTRICT	SPECIES	LB./ACRE PLS
1 (MISSOULA)	CANADA WILDRYE	3
	SECAR BLUEBUNCH WHEATGRASS	5
	CRITANA THICKSPIKE WHEATGRASS	5
	COVAR SHEEP FESCUE	2
	CEREAL BARLEY	5
2, 3, 5 (BUTTE, GREAT FALLS, BILLINGS)	CANADA WILDRYE	3
	SECAR BLUEBUNCH WHEATGRASS	5
	SODAR STREAMBANK WHEATGRASS	5
	COVAR SHEEP FESCUE	2
	CEREAL BARLEY	5
4 (GLENDIVE)	CANADA WILDRYE	3
	SECAR BLUEBUNCH WHEATGRASS	5
	ROSANA WESTERN WHEATGRASS	5
	LODORM GREEN NEEDLEGRASS	3
	CEREAL BARLEY	5

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 208
DWG. NO.
208-15
EROSION SEEDING
(P-04)
EFFECTIVE: AUGUST 1999
MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

SYMBOL: ←(RD)→

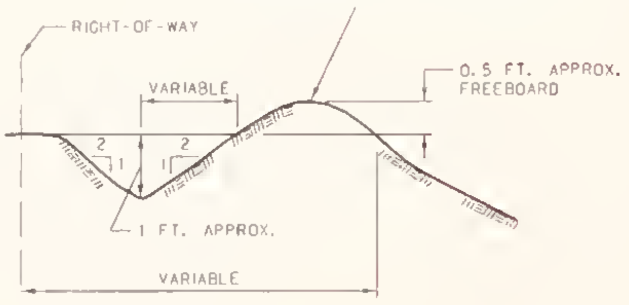
RUN-ON DIVERSION/CONTROL BMP P-05:

RUN-ON DIVERSION/CONTROL (RD) IS A BERM OF COMPACTED SOIL AND/OR A DITCH ON TOP OF CUT SLOPES TO INTERCEPT STORM WATER RUNOFF FROM THE DRAINAGE AREA ABOVE THE UNPROTECTED SLOPES AND DIRECT IT TO A STABILIZED OUTLET. IT IS USED ON THE TOP OF CUT SLOPES 2:1 AND STEEPER. EXCLUDING ROCK SLOPES THAT CANNOT BE EXCAVATED BY RIPPING. OR THE TOP OF FILL SLOPES WHERE THERE IS POTENTIAL FOR ROAD BED RUNOFF. THIS BMP CAN BE USED ON FLATTER SLOPES AT THE DISCRETION OF THE ENGINEER.

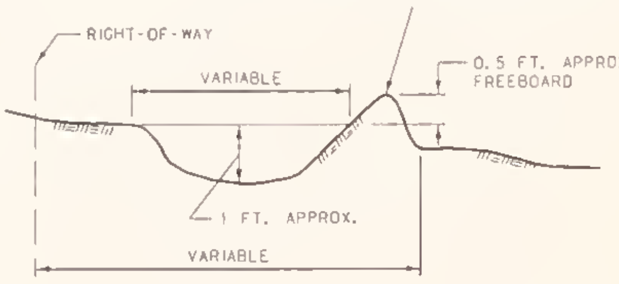
CONSTRUCT RUN-ON DIVERSION/CONTROL STRUCTURES IN CONJUNCTION WITH CLEARING AND GRUBBING AND PRIOR TO GRADING OPERATIONS. IF IT IS TO REMAIN IN PLACE FOR LONGER THAN 15 DAYS IT REQUIRES EROSION SEED. GRAVEL OR RIPRAP.

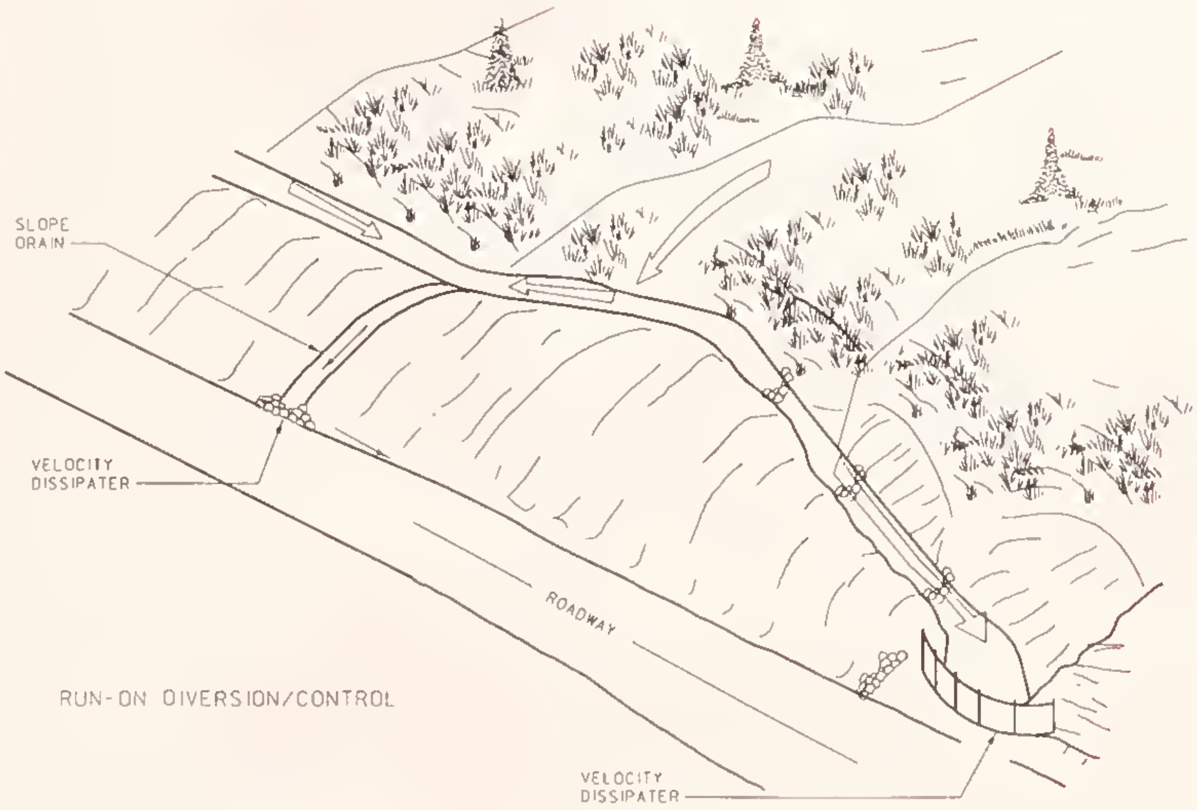
INSTALL SLOPE DRAINS WHERE NEEDED TO PREVENT CONCENTRATION OF WATER AND OVER-TOPPING OF BERM. PLACE VELOCITY DISSIPATERS AT THE TERMINUS OF DITCHES AND WHERE NEEDED. APPROPRIATE SUPPLEMENTS INCLUDE TEMPORARY SEEDING. EROSION SEEDING. SLOPE DRAINS OR DITCH SEDIMENT TRAPS.

DENSIFY TO THE SATISFACTION OF THE ENGINEER. EXCAVATION FROM CONTOUR DITCH MAY BE PLACED ON DOWNSLOPE SIDE AND SHAPED TO FORM A DIKE TO INCREASE THE DITCH CAPACITY. EROSION CONTROL SEED UPON CONSTRUCTION AND PRIOR TO COMPACTION.



EXCAVATION FROM CONTOUR DITCH MAY BE PLACED ON DOWNSLOPE SIDE AND SHAPED TO FORM A DIKE TO INCREASE THE DITCH CAPACITY. EROSION CONTROL SEED UPON CONSTRUCTION AND PRIOR TO COMPACTION.





RUN-ON DIVERSION/CONTROL

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 208
DWG. NO.
208-20
RUN-ON DIVERSION/CONTROL
(P-05)
EFFECTIVE: AUGUST 1999
MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

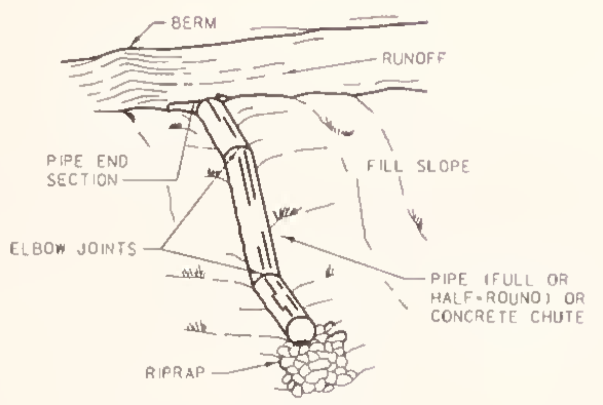
SYMBOL: (SD)

SLOPE DRAINS BMP P-06:

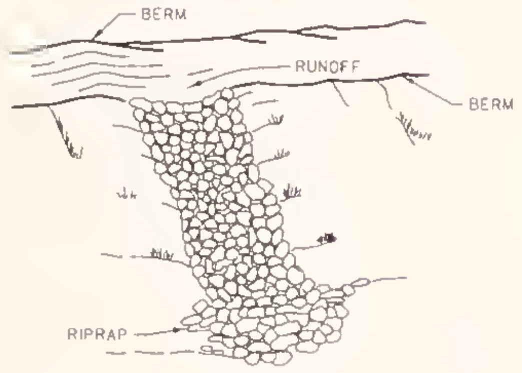
SLOPE DRAINS (SD) CONSIST OF A FLEXIBLE PIPE. RIGID PIPE. GEOTEXTILE-LINED CHANNEL OR RIPRAP-LINED CHANNEL. SLOPE DRAINS ARE USED WITH RUN-ON DIVERSION/CONTROL OR ALONG THE TOE OF FILL IN CUT TO FILL TRANSITIONS. SLOPE DRAINS EXTEND FROM THE COLLECTION POINT TO THE BOTTOM OF THE SLOPE AND DISCHARGE INTO A DRAINAGE CHANNEL OR A STABILIZED AREA (NOT STATE WATERS).

SLOPE DRAINS CONVEY CONCENTRATED RUNOFF DOWN UNPROTECTED CUT OR FILL SLOPES OR CUT/FILL TRANSITIONS WITHOUT CAUSING GULLIES. CHANNELS. OR SATURATION OF SLIDE-PRONE SOILS OF A CUT OR FILL SLOPE. DESIGN RIPRAP-LINED DITCHES ON A SITE-SPECIFIC BASIS. RIPRAP SIZE IS A FUNCTION OF EXPECTED WATER VELOCITY. APPROPRIATE SUPPLEMENTS INCLUDE VELOCITY REDUCTION AND SEDIMENT RETENTION BARRIERS.

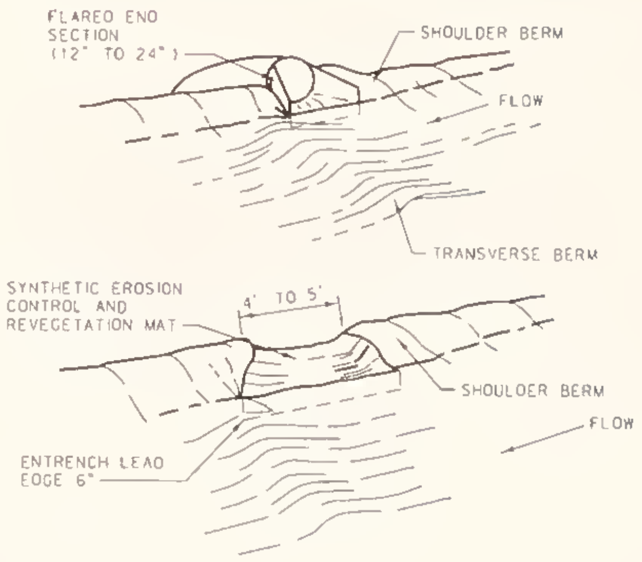
IPE SLOPE DRAIN



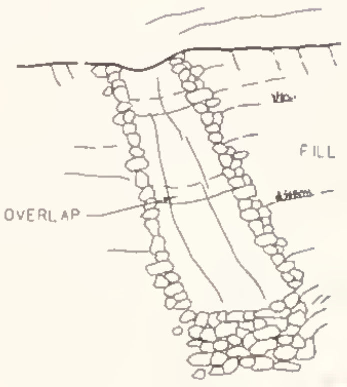
IPRAP SLOPE DRAIN



SLOPE DRAIN INLETS



ITCH LINER: SYNTHETIC EROSION CONTROL AND REVEGETATION MAT



DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 208
DWG. NO.
208-25
SLOPE DRAINS
(P-06)
EFFECTIVE: AUGUST 1999
MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

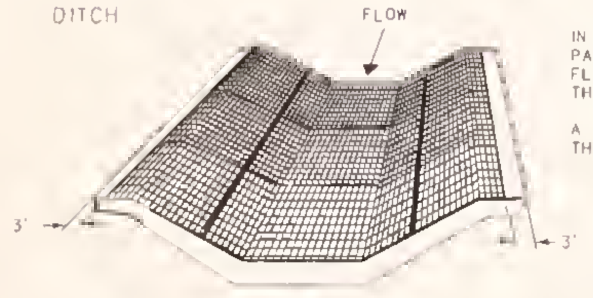
SYMBOL: (EM)

EROSION MAT BMP P-07:

EROSION MAT (EM) IS A VEGETATIVE MULCH MATERIAL. JUTE MAT. OR SYNTHETIC GEOMEMBRANE THAT MUST BE ANCHORED. EROSION MATS ARE USED TO PROTECT EXPOSED SOILS. ENHANCE PLANT ESTABLISHMENT OR LINE DITCH BOTTOMS.

LAP EROSION MATS AND ANCHOR ACCORDING TO THE MANUFACTURER'S SPECIFICATIONS. CONFORMING WITH MDT STANDARD SPECIFICATION 610.03.4. BLANKET LENGTHS ARE LIMITED TO 25 FEET TO PREVENT BRIDGING OF THE BLANKET ABOVE SETTLING SOILS. EXTEND THE TOP EDGE OF THE BLANKET AT LEAST 3 FEET BEYOND THE TOP OF THE SLOPE. EROSION MATS ARE REQUIRED WHEN THE MOST ERODABLE CONDITIONS EXIST IN THE SOIL. SLOPE. SURFACE WATER AND PRECIPITATION CATEGORIES.

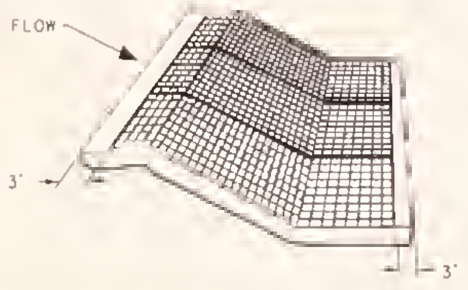
DITCH



IN DITCHES. APPLY NETTING PARALLEL TO THE DIRECTION OF FLOW. DO NOT JOIN STRIPS IN THE CENTER OF THE DITCH.

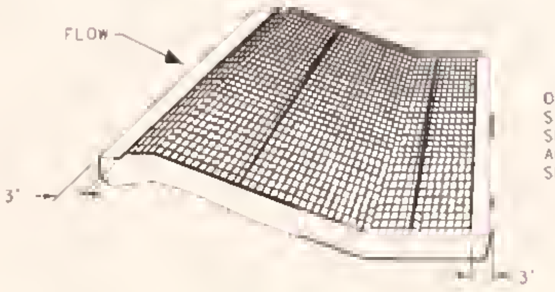
A SINGLE RUN MAY BE USED AT THE DISCRETION OF THE ENGINEER.

STEEP SLOPE



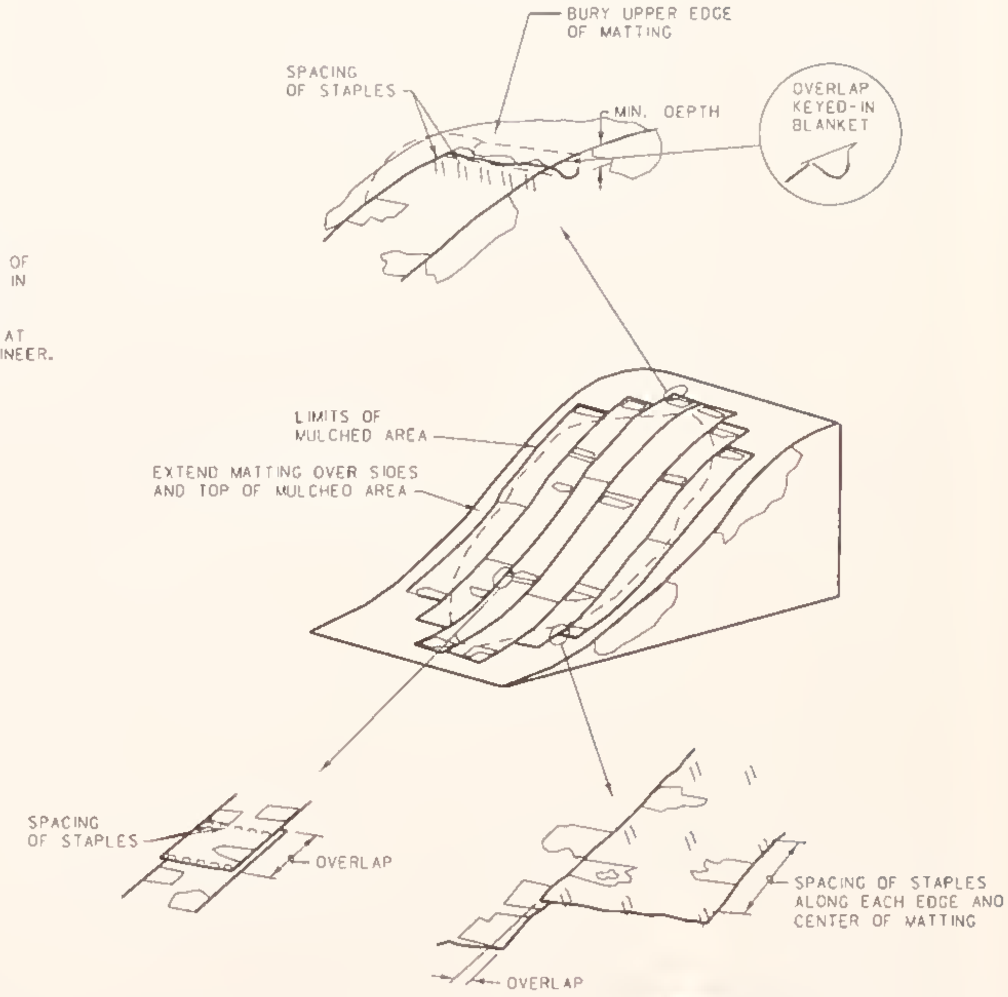
ON STEEP SLOPES. APPLY STRIPS OF NETTING PARALLEL TO THE DIRECTION OF FLOW AND ANCHOR SECURELY (STEEPER THAN 3:1 OR ACCORDING TO MANUFACTURER'S SPECIFICATIONS).

SHALLOW SLOPE



ON SHALLOW SLOPES. APPLY STRIPS OF NETTING ACROSS THE SLOPE (3:1 OR FLATTER OR ACCORDING TO MANUFACTURER'S SPECIFICATIONS).

INSTALL ACCORDING TO THE MANUFACTURER'S SPECIFICATIONS.


BURY UPPER EDGE OF MATTING
SPACING OF STAPLES
MIN. DEPTH
OVERLAP KEYED-IN BLANKET
LIMITS OF MULCHED AREA
EXTEND MATTING OVER SIDES AND TOP OF MULCHED AREA
SPACING OF STAPLES
OVERLAP
SPACING OF STAPLES ALONG EACH EDGE AND CENTER OF MATTING
OVERLAP

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 208
DWG. NO.
208-30
EROSION MAT
(P-07)
EFFECTIVE: AUGUST 1999
MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

SYMBOL:

DITCH SEDIMENT TRAPS BMP R-01:

DITCH SEDIMENT TRAPS (DT#) IS TERMINOLOGY USED TO DESCRIBE THE SELECTION OF ONE OF FOUR TEMPORARY SEDIMENT BARRIERS USED AT INTERVALS ALONG A CONCENTRATED RUNOFF FLOW PATH. THE DESIGNER DETERMINES THE LOCATIONS REQUIRING DITCH SEDIMENT TRAPS AND THE PROPER INTERVALS AND THE ENGINEER DETERMINES WHICH TEMPORARY SEDIMENT BARRIER WILL BE USED. REFER TO DUGOUT DITCH BASIN, GRAVEL FILTER BERM, SEDIMENT CONTROL FENCE AND EROSION MAT DETAILED DRAWINGS FOR INSTALLATIONS.

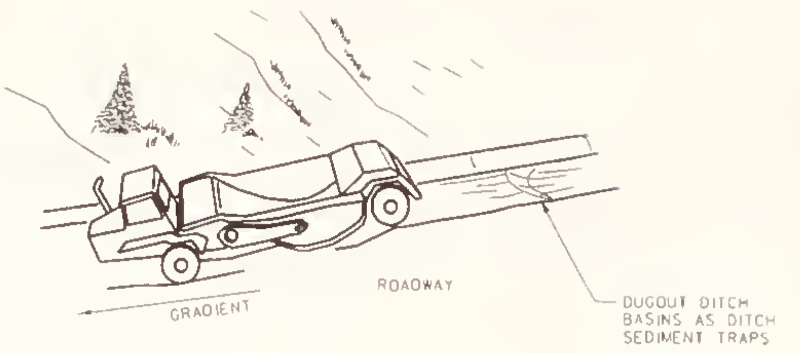
DITCH SEDIMENT TRAPS ARE USED FOR LONGITUDINAL ROADSIDE DITCHES IN A CUT SECTION OR AS LONGITUDINAL SEDIMENT RETENTION BASINS AT THE TOE OF FILLS. DITCH SEDIMENT TRAPS REDUCE RUNOFF VELOCITY AND PROMOTE SEDIMENT SETTLING. THE DISTANCE BETWEEN DITCH SEDIMENT TRAPS IS DEPENDENT ON THE LENGTH OF DITCH SECTION RELATING TO THE GRADE THAT NEEDS SEDIMENT RETENTION. THE INTERVAL IS AS FOLLOWS:

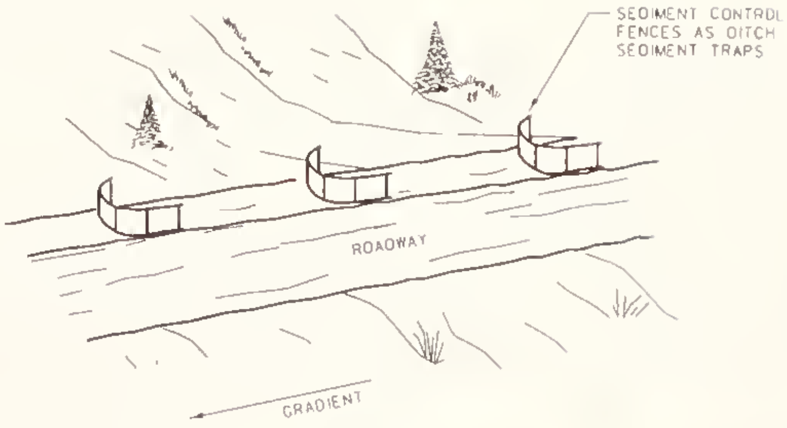
DT1 : 2% TO 3%
DUGOUT DITCH BASINS AT 300 FEET OR
GRAVEL FILTER BERMS AT 300 FEET OR
SEDIMENT CONTROL FENCES AT 500 FEET OR
EROSION MAT

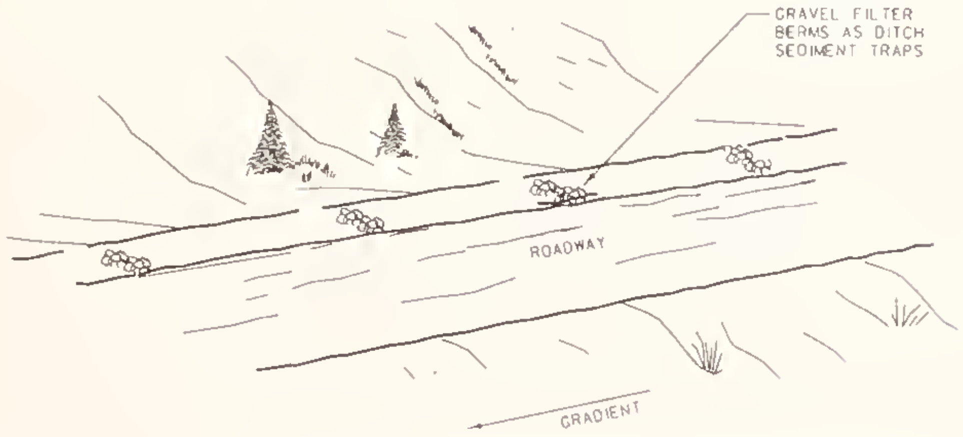
DT2 = 3% TO 4%
DUGOUT DITCH BASINS AT 150 FEET OR
GRAVEL FILTER BERMS AT 200 FEET OR
SEDIMENT CONTROL FENCES AT 300 FEET OR
EROSION MAT

DT3 = 4% +
DUGOUT DITCH BASINS AT 50 FEET OR
GRAVEL FILTER BERMS AT 100 FEET OR
SEDIMENT CONTROL FENCES AT 150 FEET OR
EROSION MAT

THESE VALUES ARE EMPIRICAL; THEY ARE THE MAXIMUM INTERVAL DISTANCES FOR A 2 YEAR, 24 HOUR RAIN EVENT. INTERVALS MAY BE SHORTENED AT THE DISCRETION OF THE ENGINEER IF SOIL CONDITIONS AND/OR PRECIPITATION INDICATE A NEED TO DO SO.







DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 208
DWG. NO.
208-35

DITCH SEDIMENT TRAPS
(R-01)

EFFECTIVE: AUGUST 1999

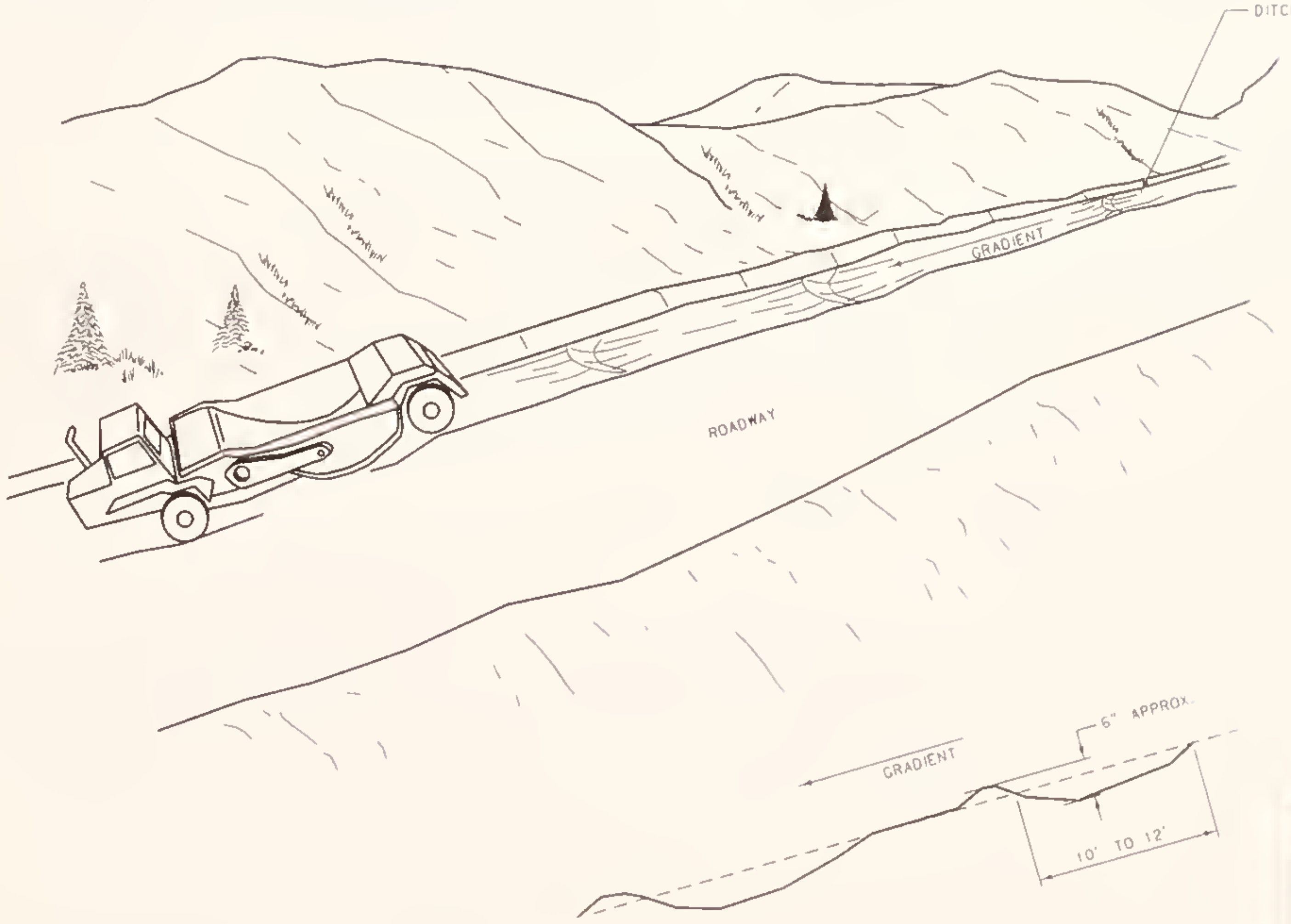
MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

SYMBOL:

DUGOUT DITCH BASIN BMP R-02:

DUGOUT DITCH BASINS (DDB) CONSIST OF ONE OR A SERIES OF SMALL DUGOUT BASINS USED FOR CONCENTRATED FLOWS TO REDUCE RUNOFF VELOCITY, PROMOTE SEDIMENT RETENTION AND ALLOW SETTLING. THE MAXIMUM HEIGHT FOR DUGOUT DITCH BASINS USED INSIDE THE CLEAR ZONE IS 6 INCHES.

DUGOUT DITCH BASINS ARE USED FOR LONGITUDINAL SLOPE STEEPNESS (GRADE) SEDIMENT RETENTION. APPLICATIONS INCLUDE DITCH SEDIMENT TRAPS, INTERCEPTOR DITCHES AND TOE OF SLOPE PROTECTION. DISTANCES BETWEEN DUGOUT DITCH BASINS ARE SHOWN ON DTL. DWG. NO. 208-35 FOR USE IN DITCH SEDIMENT RETENTION. USE ON SLOPES IS DEPENDENT ON SOIL TYPES.



DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 208
DWG. NO.
208-40

DUGOUT DITCH BASIN
(R-02)

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

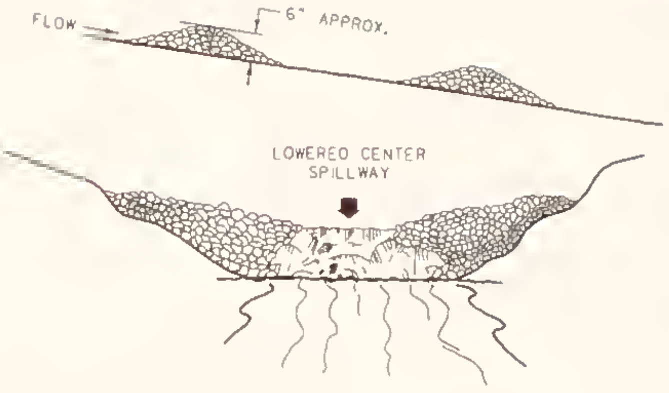
SYMBOL: —(GFB)—

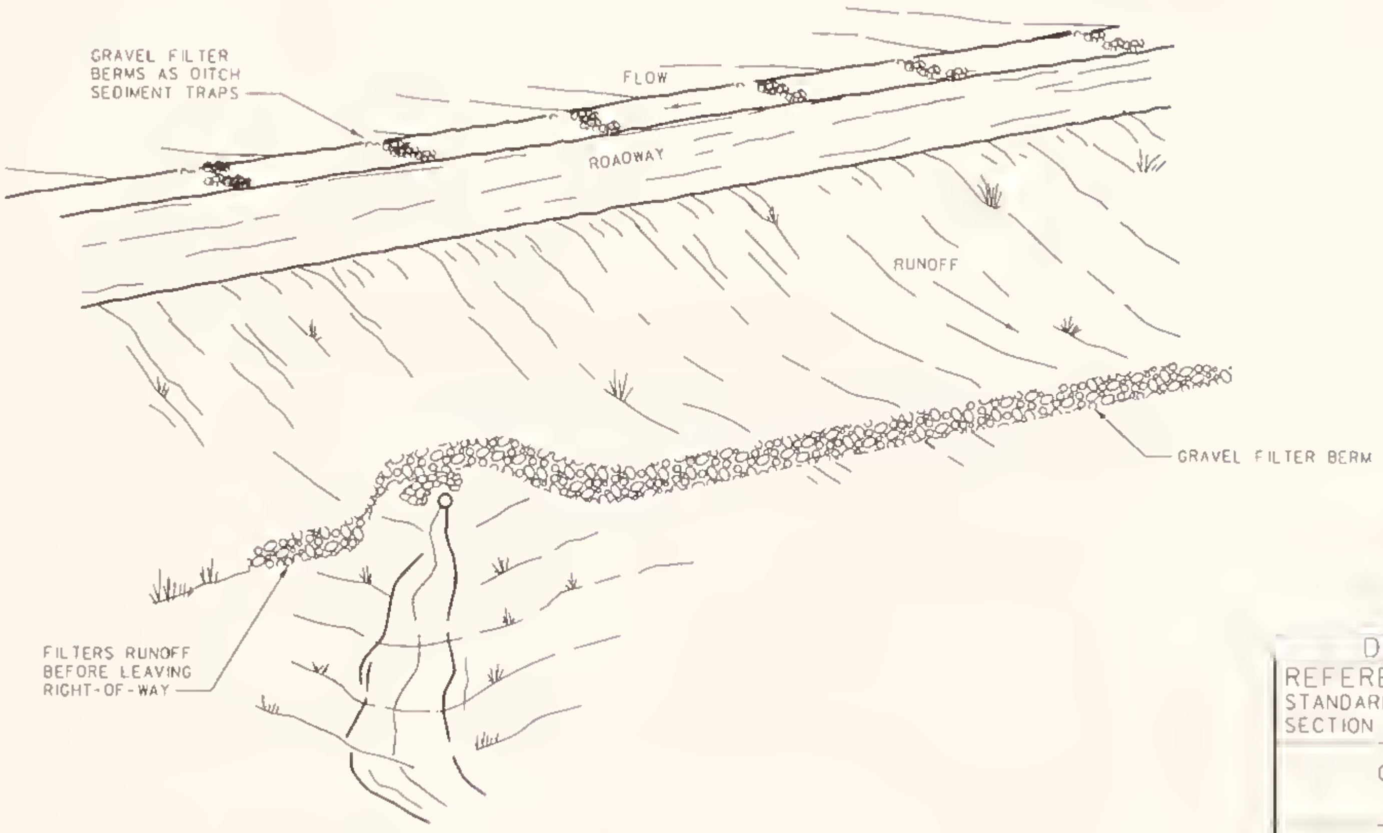
GRAVEL FILTER BERM BMP R-03:

GRAVEL FILTER BERMS (GFB) CONSIST OF A SINGLE OR SERIES OF GRAVEL BERMS TO REDUCE RUNOFF VELOCITIES AND RETAIN SEDIMENT. THE MAXIMUM HEIGHT FOR GRAVEL FILTER BERMS USED INSIDE THE CLEAR ZONE IS 6 INCHES.

BERM MATERIAL MUST BE 100% PASSING THE 2" SCREEN AND 10% MAXIMUM PASSING THE NO. 4 SIEVE. BERM MATERIAL MAY BE PITRUN OR CRUSHED AGGREGATE.

GRAVEL FILTER BERMS ARE USED FOR SHEET OR CONCENTRATED FLOWS TO REDUCE RUNOFF VELOCITY, PROMOTE SEDIMENT RETENTION AND ALLOW SETTLING. APPLICATIONS INCLUDE DITCH SEDIMENT TRAPS, INLET/OUTLET PROTECTION AND TOE OF SLOPE PROTECTION. AS A DITCH SEDIMENT TRAP, THE END OF THE BARRIER MUST EXTEND A SUFFICIENT DISTANCE TO PREVENT END CUTTING. POSITION THE BARRIER TO PREVENT SEDIMENT FROM ENTERING DRAINAGE. DO NOT PLACE THE BARRIER ACROSS LIVE STREAMS. DISTANCES BETWEEN GRAVEL FILTER BERMS ARE SHOWN ON DTL. DWG. NO. 208-35 FOR USE IN DITCH SEDIMENT RETENTION. REMOVE SEDIMENT FROM BEHIND THE BERM WHEN IT ACCUMULATES TO ONE-HALF THE ORIGINAL HEIGHT UNLESS ITS DRAINAGE AREA HAS BEEN STABILIZED.




GRAVEL FILTER BERMS AS DITCH SEDIMENT TRAPS
FLOW
ROADWAY
RUNOFF
GRAVEL FILTER BERM
FILTERS RUNOFF BEFORE LEAVING RIGHT-OF-WAY

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 208
DWG. NO.
208-45

GRAVEL FILTER BERM
(R-03)

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

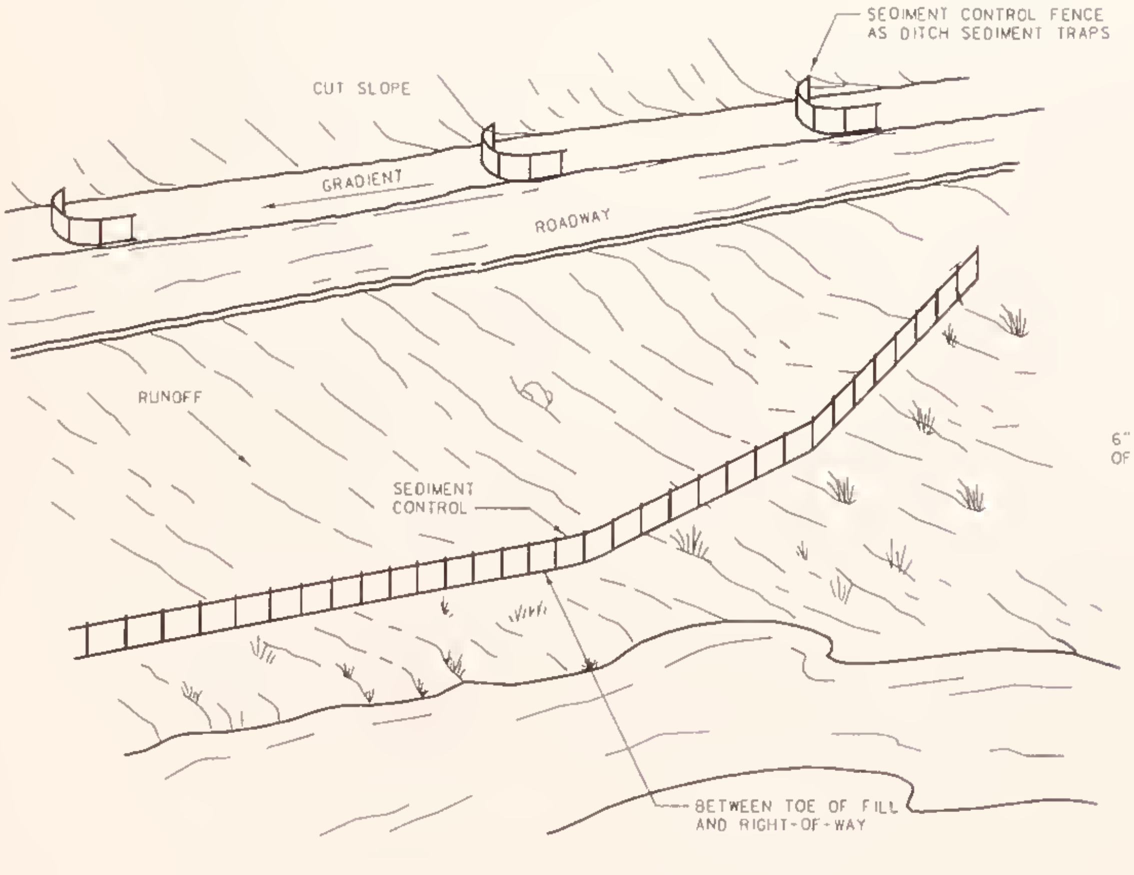
SYMBOL: —(SCF)—

SEDIMENT CONTROL FENCE BMP R-04:

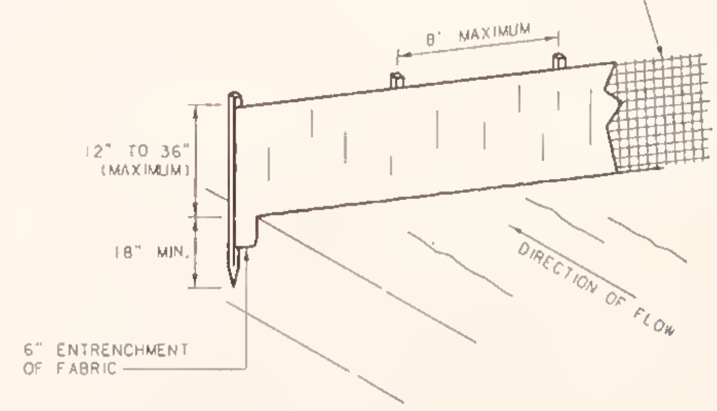
SEDIMENT CONTROL FENCE (SCF) IS A SINGLE OR SERIES OF FILTER FABRIC SEDIMENT BARRIER STRETCHED AND ATTACHED TO SUPPORTING POSTS. THE FENCE BOTTOM IS ENTRENCHED.

SEDIMENT CONTROL FENCES ARE USED FOR SHEET OR CONCENTRATED FLOWS TO ASSIST IN SEDIMENT CONTROL BY RETAINING SOME OF THE ERODED SOIL PARTICLES AND SLOWING THE RUNOFF VELOCITY TO ALLOW PARTICLE SETTLING. APPLICATIONS INCLUDE DITCH SEDIMENT TRAPS, WATER RESOURCE PROTECTION, INLET/OUTLET PROTECTION, BANK PROTECTION, TOE OF SLOPE PROTECTION AND CHANNEL CHANGES. INSTALL SEDIMENT CONTROL FENCES PRIOR TO DISTURBING AREAS REQUIRING THIS BMP OR AS SLOPE GRADES ARE ACHIEVED. MAXIMUM CUT OR FILL SLOPE FOR A SEDIMENT CONTROL FENCE IS 2:1. USE 2 INCH BY 2 INCH (NOMINAL) WOODEN STAKES. DO NOT USE METAL STAKES.

SEDIMENT CONTROL FENCES ARE USED BETWEEN THE EDGE OF CONSTRUCTION DISTURBANCE AND A WATER RESOURCE, CRITICAL RESOURCE OR RIGHT-OF-WAY LINE THAT IS ADJACENT TO CONSTRUCTION ACTIVITY. IN DITCHES AND SWALES THE ENDS OF THE FENCE CURVE UPSTREAM TO PREVENT FLOW FROM BY-PASSING THE FENCE. POSITION THE BARRIER TO PREVENT SEDIMENT FROM ENTERING THE DRAINAGE. DO NOT PLACE THE BARRIER ACROSS LIVE STREAMS. WOVEN WIRE BACKING IS NECESSARY WHEN DEALING WITH HEAVIER FLOW VELOCITIES AND SEDIMENT OR AS A ROCK BARRIER. DISTANCES BETWEEN SEDIMENT CONTROL FENCES ARE SHOWN ON DTL. DWG. NO. 208-35 FOR USE IN DITCH SEDIMENT RETENTION. REMOVE SEDIMENT FROM BEHIND THE FENCE WHEN IT ACCUMULATES TO ONE-THIRD THE ORIGINAL HEIGHT. EITHER GRADE AND SEED OR REMOVE THE SEDIMENT DEPOSITS PRIOR TO REMOVAL OF THE FENCE.


SEDIMENT CONTROL FENCE AS DITCH SEDIMENT TRAPS
CUT SLOPE
GRADIENT
ROADWAY
RUNOFF
SEDIMENT CONTROL
BETWEEN TOE OF FILL AND RIGHT-OF-WAY

DITCH SEDIMENT TRAPS & PROTECTION OF LIVE STREAM


WOVEN WIRE BACKING FOR HEAVIER FLOWS
8' MAXIMUM
12" TO 36" (MAXIMUM)
18" MIN.
6" ENTRENCHMENT OF FABRIC
DIRECTION OF FLOW

SILT FENCE CONSTRUCTION

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 208
DWG. NO.
208-50

SEDIMENT CONTROL FENCE
(R-04)

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

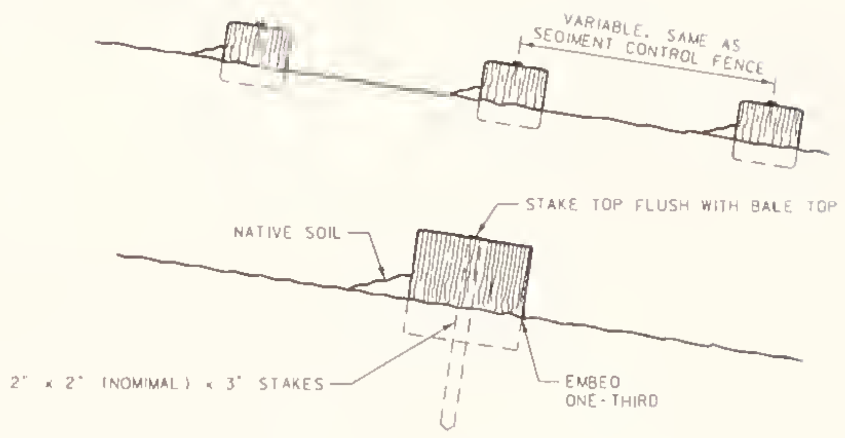
SYMBOL: ←(SBB)→

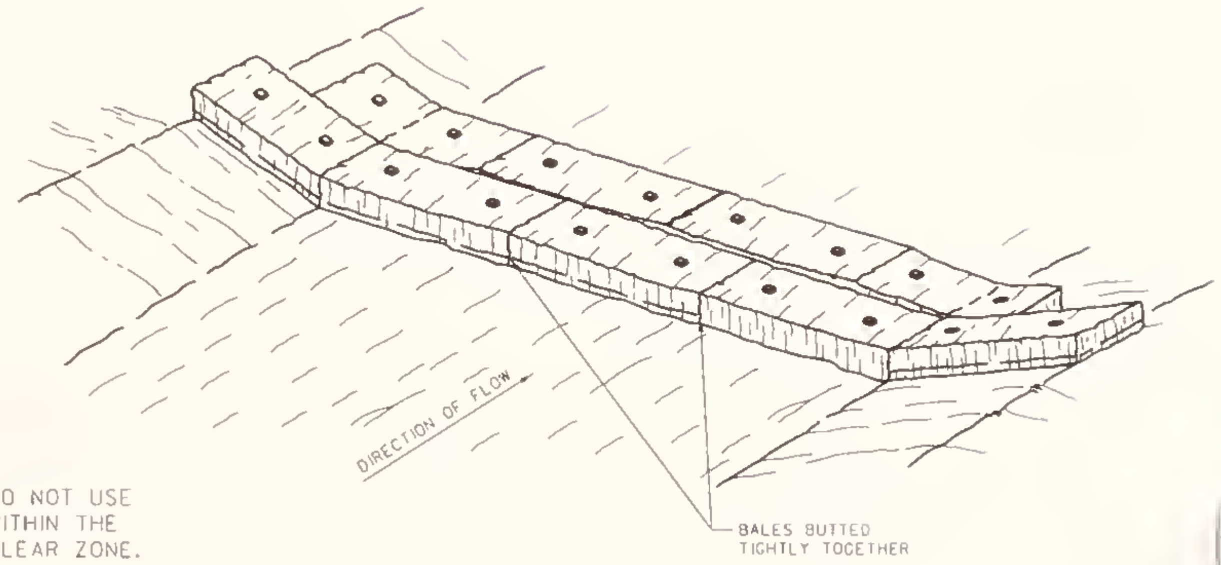
STRAW BALE BARRIER BMP R-05:

STRAW BALE BARRIER (SBB) IS A SEDIMENT BARRIER CONSISTING OF ENTRENCHED, OVERLAPPING AND ANCHORED STRAW BALES TO REDUCE RUNOFF VELOCITIES AND RETAIN SEDIMENT. DO NOT USE STRAW BALE BARRIERS INSIDE THE CLEAR ZONE. STRAW BALES MUST BE CERTIFIED WEED-FREE.

STRAW BALE BARRIERS ARE USED FOR SHEET OR CONCENTRATED FLOWS TO REDUCE RUNOFF VELOCITY, PROMOTE SEDIMENT RETENTION AND ALLOW SETTLING. ENTRENCH THE BARRIER APPROXIMATELY ONE-THIRD OF THE BALE'S HEIGHT AND BACKFILL ON THE UPHILL SIDE. USE 2 INCH BY 2 INCH (NOMINAL) BY 3 FOOT LONG WOODEN STAKES. DO NOT USE METAL STAKES. USE A MINIMUM OF TWO STAKES PER BALE.

AS A DITCH SEDIMENT TRAP, EXTEND THE END OF THE BARRIER TO SUCH AN EXTENT THAT THE BOTTOMS OF THE END BALES ARE HIGHER THAN THE TOPS OF THE LOWEST CENTER BALES. POSITION THE BARRIER TO PREVENT SEDIMENT FROM ENTERING THE DRAINAGE. DO NOT PLACE THE BARRIER ACROSS LIVE STREAMS. REPAIR OR REPLACE DAMAGED, UNDER-CUT OR END RUN BALES. APPLICATIONS INCLUDE (OUTSIDE THE CLEAR ZONE) DITCH SEDIMENT TRAPS, INLET/OUTLET PROTECTION, BANK PROTECTION AND TOE OF SLOPE PROTECTION.


VARIABLE, SAME AS SEDIMENT CONTROL FENCE
STAKE TOP FLUSH WITH BALE TOP
NATIVE SOIL
2" x 2" (NOMINAL) x 3' STAKES
EMBED ONE-THIRD



DO NOT USE
WITHIN THE
CLEAR ZONE.

DETAILED DRAWING
REFERENCE STANDARD SPEC. SECTION 208
DWG. NO 208-55

STRAW BALE BARRIER
(R-05)

EFFECTIVE: AUGUST 1999

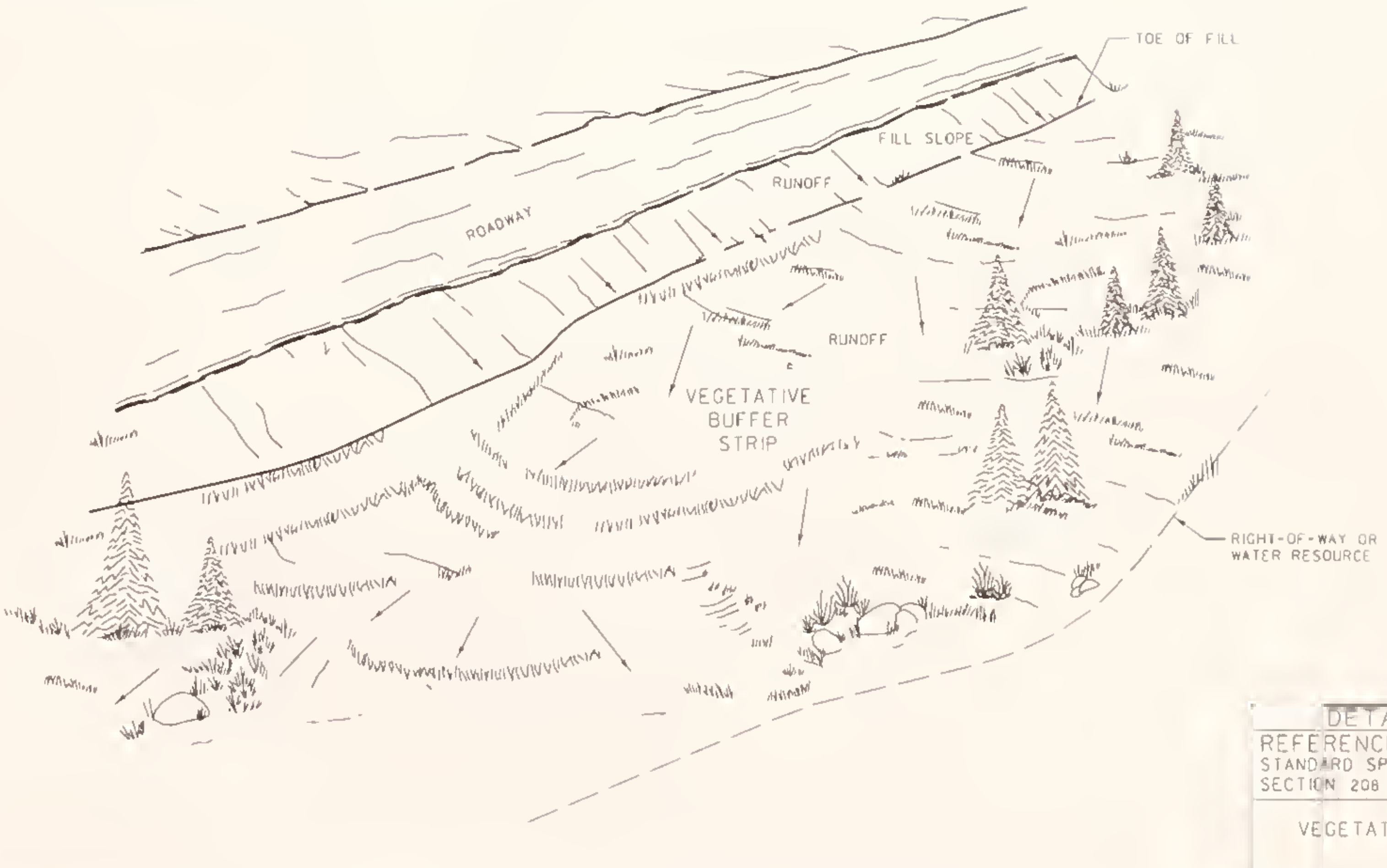
MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

SYMBOL: ←(VBS)→

VEGETATIVE BUFFER STRIP BMP R-06:

VEGETATIVE BUFFER STRIP (VBS) IS AN UNDISTURBED AREA OR STRIP OF ESTABLISHED NATURAL VEGETATION. A VEGETATIVE BUFFER STRIP PROVIDES A LIVING SEDIMENT FILTER TO REDUCE RUNOFF VELOCITIES AND ALLOW CAPTURE AND SETTLING OF COARSE GRAINED SEDIMENT. VEGETATIVE BUFFER STRIPS REDUCE OR PREVENT SEDIMENTATION FROM LEAVING THE RIGHT-OF-WAY.

IDENTIFY VEGETATIVE BUFFER STRIPS WITH FLAGGING BEFORE CONSTRUCTION OCCURS. KEEP EQUIPMENT AND FILL MATERIAL OFF OF VEGETATIVE BUFFER STRIPS. ALWAYS CONSIDER VEGETATIVE BUFFER STRIPS WHEN WATER RESOURCES ARE ADJACENT TO OR NEAR DISTURBANCES AND REQUIRE PROTECTION. THE MINIMUM WIDTH REQUIREMENT FOR A WELL-ESTABLISHED VEGETATIVE STRIP WITH A SLOPE OF 3:1 OR FLATTER IS 50 FEET. THE MINIMUM WIDTH REQUIREMENT FOR A WELL-ESTABLISHED VEGETATIVE STRIP WITH A SLOPE STEEPER THAN 3:1 IS 100 FEET. APPROPRIATE SUPPLEMENTS INCLUDE GRAVEL BERMS, SEDIMENT CONTROL FENCES AND OTHER SEDIMENT RETENTION BARRIERS.



DETAILED DRAWING
REFERENCE STANDARD SPEC. SECTION 208
DWG. NO. 208-60

VEGETATIVE BUFFER STRIP
(R-06)

EFFECTIVE: AUGUST 1999

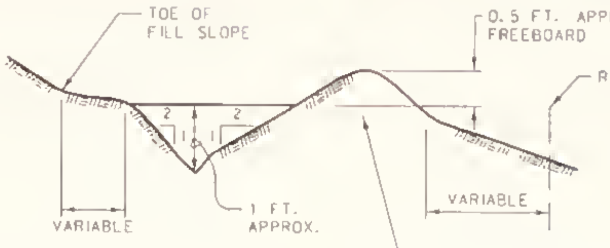
MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

SYMBOL: ←(RID)→

RUNOFF INTERCEPTION DITCH BMP R-07:

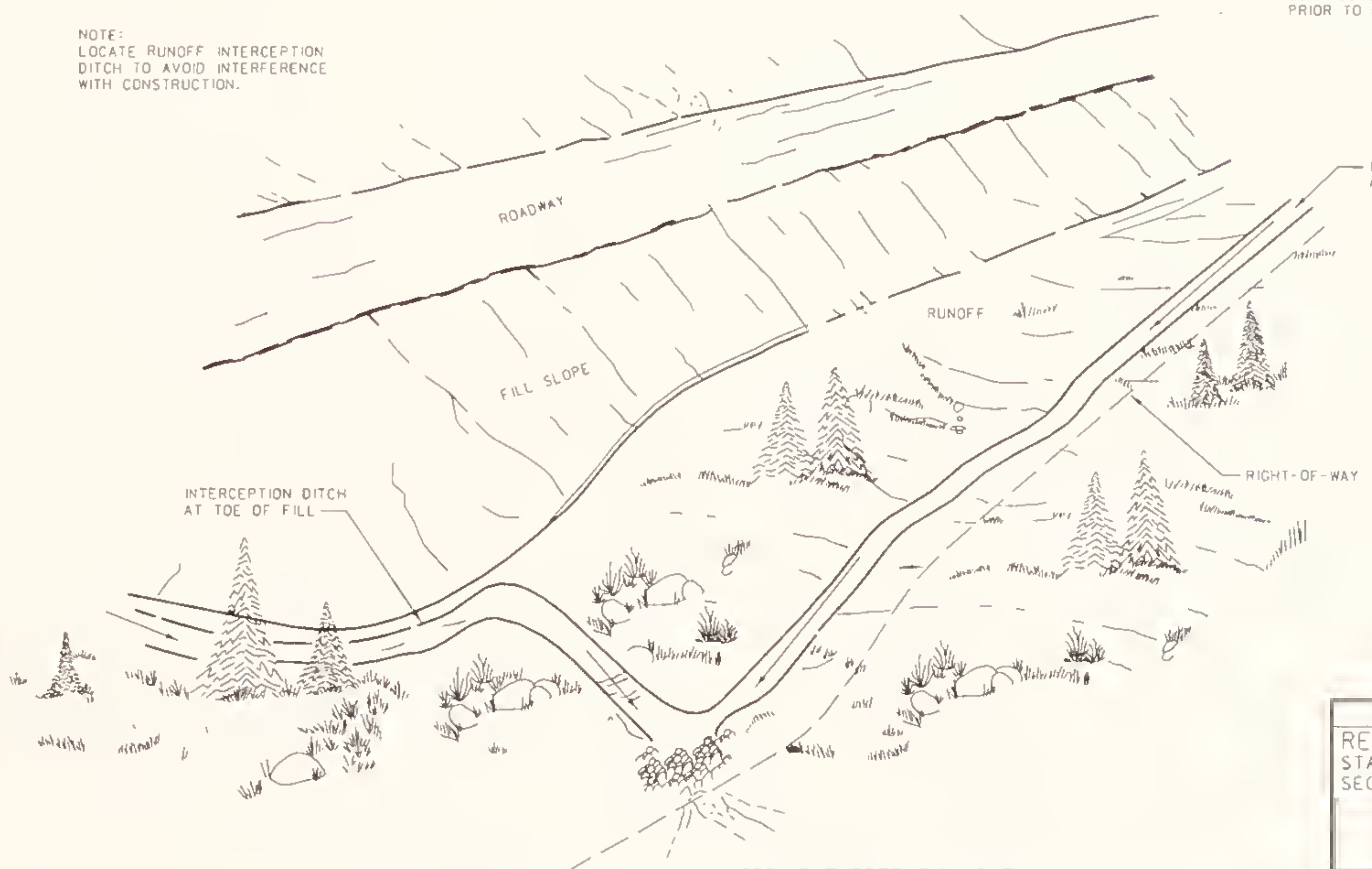
RUNOFF INTERCEPTION DITCHES (RID) INTERCEPT AND CONVEY SHEET FLOW RUNOFF TO SEDIMENT RETENTION BARRIERS. INTERCEPTED FLOWS PREVENT OFF-SITE DISCHARGE OF STORM WATER AND SEDIMENTATION.

USE RUNOFF INTERCEPTION DITCHES AT THE TOE OF SLOPES OR BETWEEN DISTURBED AREAS AND RIGHT-OF-WAY LINES TO PREVENT FLOWS FROM CARRYING SEDIMENT OFF-SITE. APPROPRIATE SUPPLEMENTS INCLUDE SLOPE DRAINS OR DITCH SEDIMENT TRAPS.



DENSIFY TO THE SATISFACTION OF THE ENGINEER. EXCAVATION FROM CONTOUR DITCH MAY BE PLACED ON DOWNSLOPE SIDE AND SHAPED TO FORM A DIKE TO INCREASE THE DITCH CAPACITY. EROSION CONTROL SEED UPON CONSTRUCTION AND PRIOR TO COMPACTION.

NOTE:
LOCATE RUNOFF INTERCEPTION DITCH TO AVOID INTERFERENCE WITH CONSTRUCTION.



SEDIMENT RETENTION BMP

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 208
DWG. NO.
208-65

RUNOFF INTERCEPTION DITCH
(R-07)

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT
OF TRANSPORTATION
MONTANA
CADD

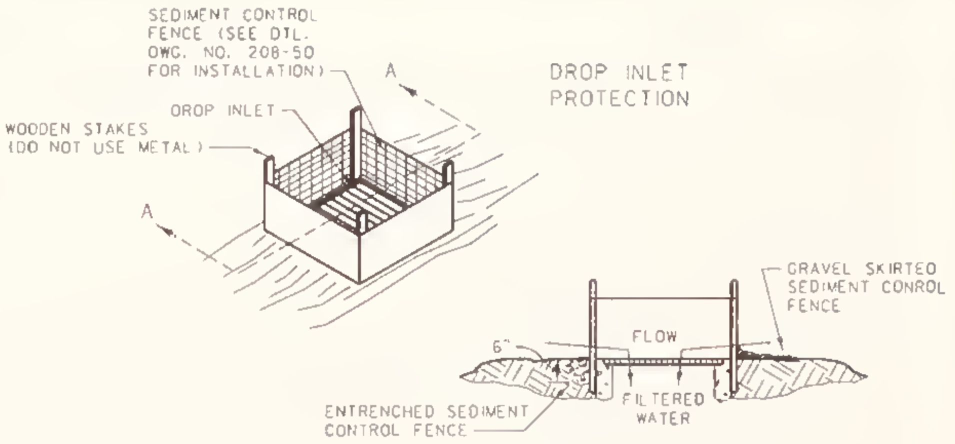
SYMBOL: (I/O)

INLET/OUTLET PROTECTION BMP R-08:

INLET/OUTLET PROTECTION (I/O) ARE STRUCTURES ASSOCIATED WITH SEDIMENT REMOVAL AT INLETS AND SEDIMENT REMOVAL AT PIPE OUTLETS. THE PURPOSE OF THIS BMP IS TO ALLOW STORM WATERS OF INTERMITTENT DRAINAGES TO FLOW THROUGH DISTURBED AREAS WITH MINIMAL IMPACT DURING STORM EVENTS AND TO KEEP SEDIMENT FROM LEAVING MDT PROPERTY.

INLET/OUTLET PROTECTION IS USED AT CULVERT INSTALLATIONS THAT DISCHARGE DIRECTLY INTO A WATER RESOURCE OR CULTURAL AND HISTORICAL RESOURCE ADJACENT TO THE RIGHT-OF-WAY LINE. DO NOT USE INLET/OUTLET PROTECTION ON STOCK UNDERPASSES OR APPROACH CULVERTS.

DROP INLET
PROTECTION

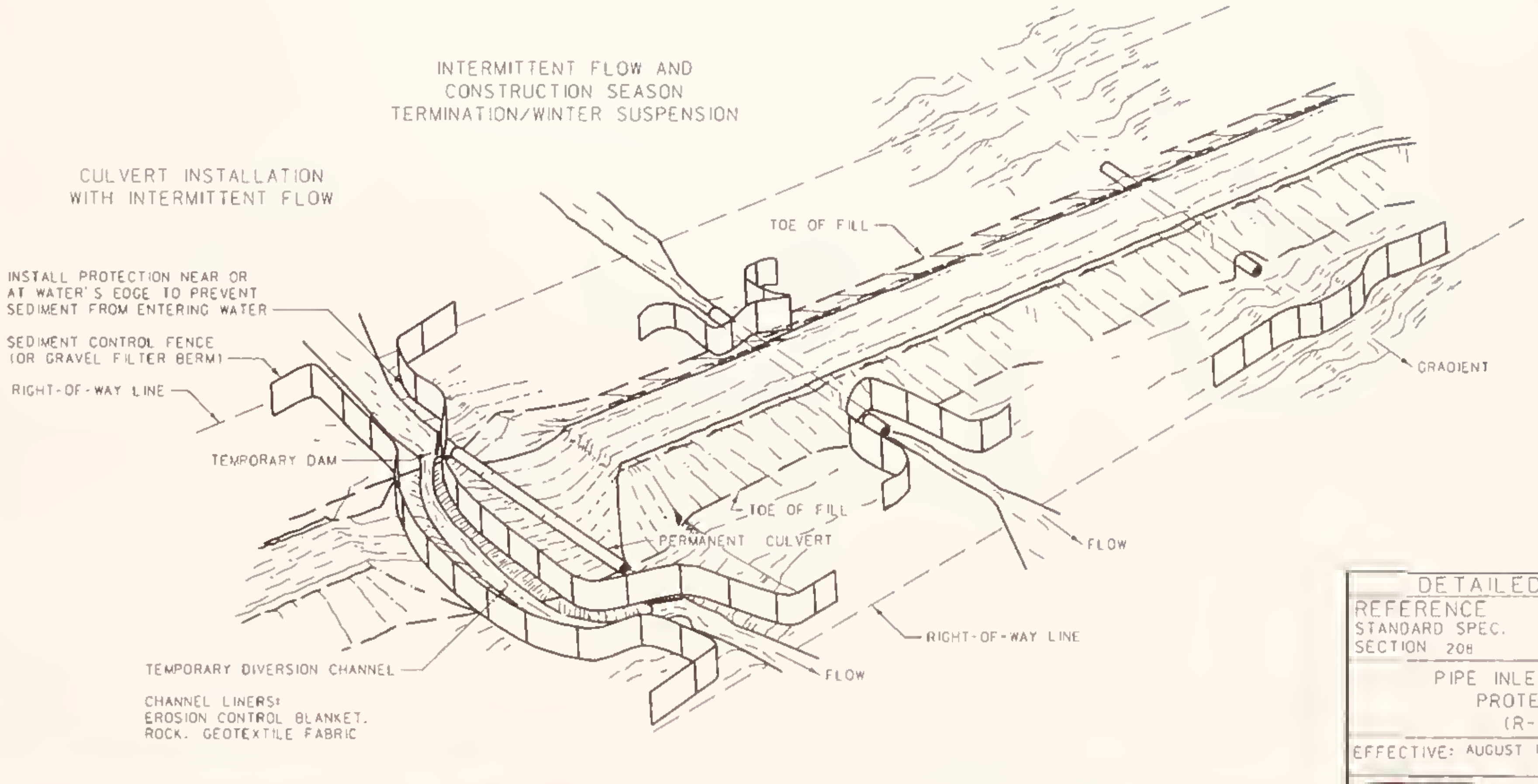


SECTION A-A

CULVERT IN A SWALE

INTERMITTENT FLOW AND
CONSTRUCTION SEASON
TERMINATION/WINTER SUSPENSION

CULVERT INSTALLATION
WITH INTERMITTENT FLOW



DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 208
DWG. NO.
208-70

PIPE INLET/OUTLET
PROTECTION
(R-08)

EFFECTIVE: AUGUST 1999

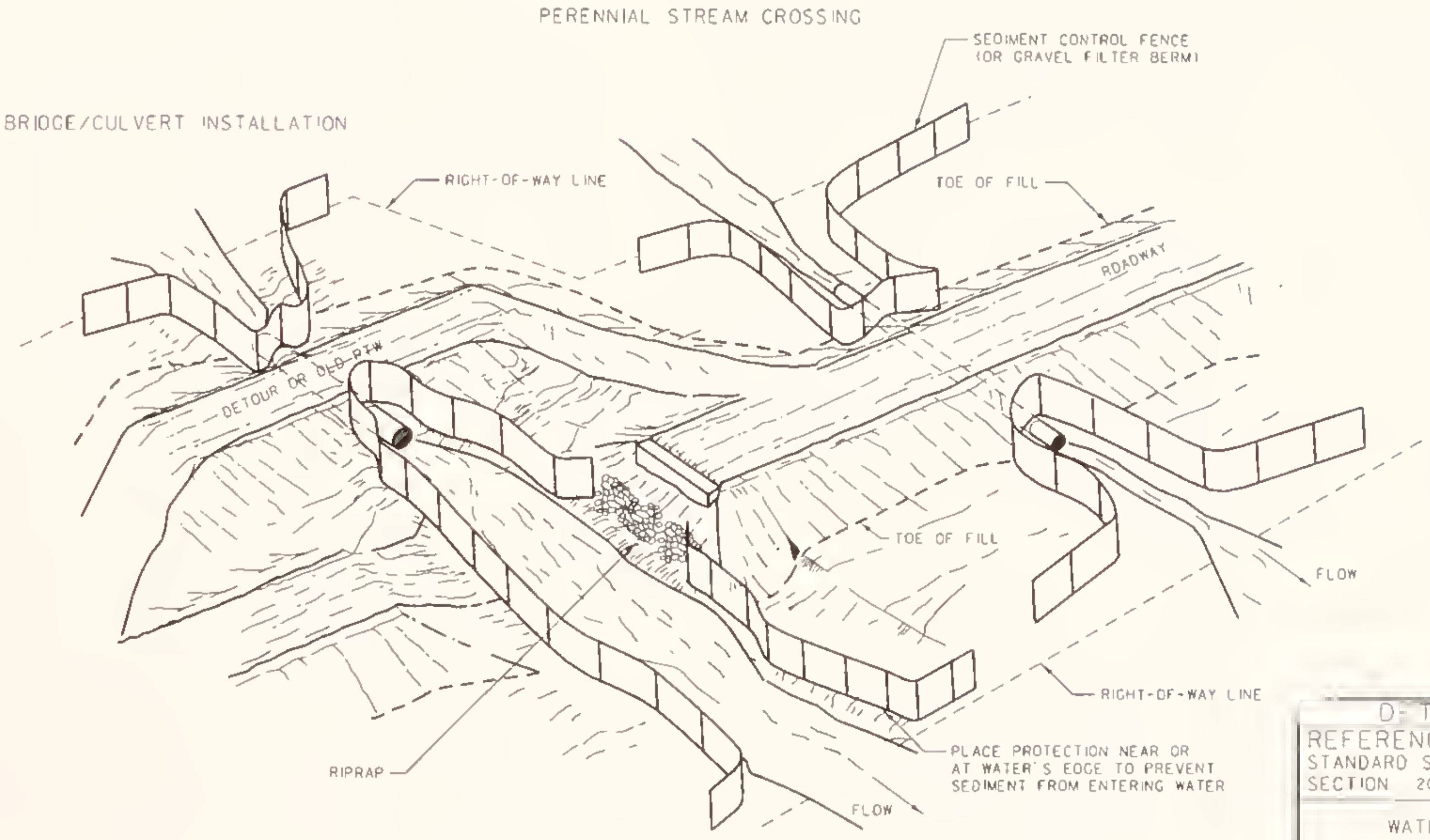
MONTANA DEPARTMENT
OF TRANSPORTATION
MONTANA
CADD

SYMBOL: (WP)

WATERWAY PROTECTION BMP W-01:

WATERWAY PROTECTION (WP) IS AN EROSION CONTROL FOR CONSTRUCTION ACTIVITIES CROSSING WATER RESOURCES. WATERWAY PROTECTION APPLIES TO PERENNIAL STREAM CROSSINGS, WETLANDS, CHANNEL CHANGES, STREAM BANK DISTURBANCES, IRRIGATION SYSTEMS OR OTHER IMPACTS TO WATER RESOURCES FROM BRIDGE CONSTRUCTION OR CULVERT INSTALLATIONS.

APPROPRIATE BMP FEATURES INCLUDE EROSION MAT, GRAVEL FILTER BERM, SEDIMENT CONTROL FENCE, STRAW BALE BARRIER OR VEGETATIVE BUFFER STRIP. ADDITIONAL BMP FEATURES INCLUDE SLOPE ROUGHENING, RUN-ON DIVERSION/CONTROL, DITCH SEDIMENT TRAP, DUGOUT DITCH BASINS AND RUNOFF INTERCEPTION DITCH. THIS BMP LIST IS NOT COMPREHENSIVE AND DOES NOT SUPERSEDE MDT STANDARD SPECIFICATIONS OR MANDATES AND REQUIREMENTS SPECIFIED BY OTHER AUTHORIZED STATE AND FEDERAL AGENCIES.


PERENNIAL STREAM CROSSING
BRIDGE/CULVERT INSTALLATION
SEDIMENT CONTROL FENCE (OR GRAVEL FILTER BERM)
RIGHT-OF-WAY LINE
TOE OF FILL
ROADWAY
DETOUR OR OLD RTW
TOE OF FILL
FLOW
RIGHT-OF-WAY LINE
PLACE PROTECTION NEAR OR AT WATER'S EDGE TO PREVENT SEDIMENT FROM ENTERING WATER
RIPRAP
FLOW

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 208
DWG. NO.
208-75

WATERWAY PROTECTION
(W-01)

EFFECTIVE: AUGUST 1999

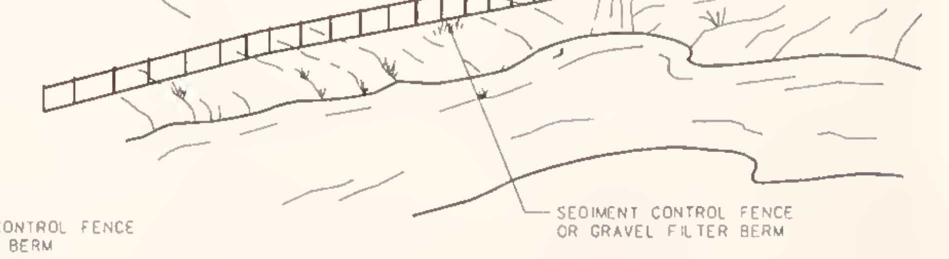
MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

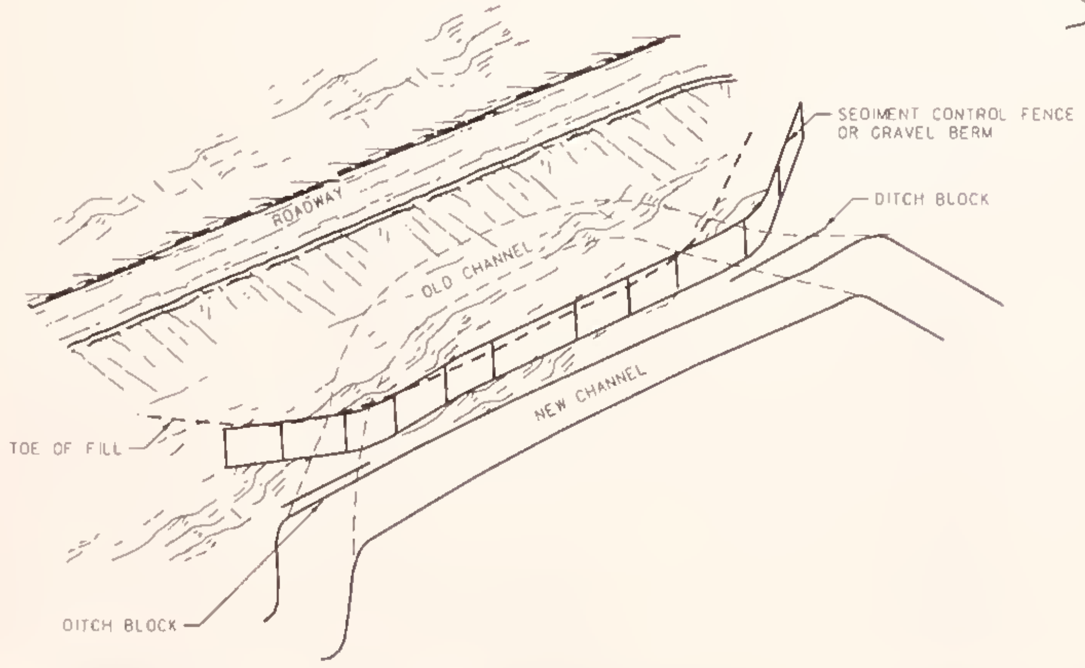
SYMBOL: ← (WR) →

WATER RESOURCE PROTECTION BMP W-02:

WATER RESOURCE PROTECTION (WR) IS EROSION CONTROL FOR CONSTRUCTION ACTIVITIES ADJACENT TO WATER RESOURCES. WATER RESOURCE PROTECTION APPLIES TO PERENNIAL STREAMS, WETLANDS, CHANNEL CHANGES, STREAM BANK DISTURBANCES, IRRIGATION SYSTEMS OR OTHER IMPACTS TO WATER RESOURCES FROM ROAD CONSTRUCTION. IT CAN BE USED FOR CRITICAL RESOURCES. THE DESIGNER DENOTES "CRITICAL RESOURCE" ON THE PLANS AND PUTS WATER RESOURCE PROTECTION WITH IT.

APPROPRIATE BMP FEATURES INCLUDE EROSION MAT, GRAVEL FILTER BERM, SEDIMENT CONTROL FENCE, STRAW BALE BARRIER OR VEGETATIVE BUFFER STRIP ADDITIONAL BMP FEATURES INCLUDE SLOPE ROUGHENING, RUN-ON DIVERSION/CONTROL, DITCH SEDIMENT TRAP, DUGOUT DITCH BASINS AND RUNOFF INTERCEPTION DITCH. THIS BMP LIST IS NOT COMPREHENSIVE AND DOES NOT SUPERSEDE MDT STANDARD SPECIFICATIONS OR MANDATES AND REQUIREMENTS SPECIFIED BY OTHER AUTHORIZED STATE AND FEDERAL AGENCIES.



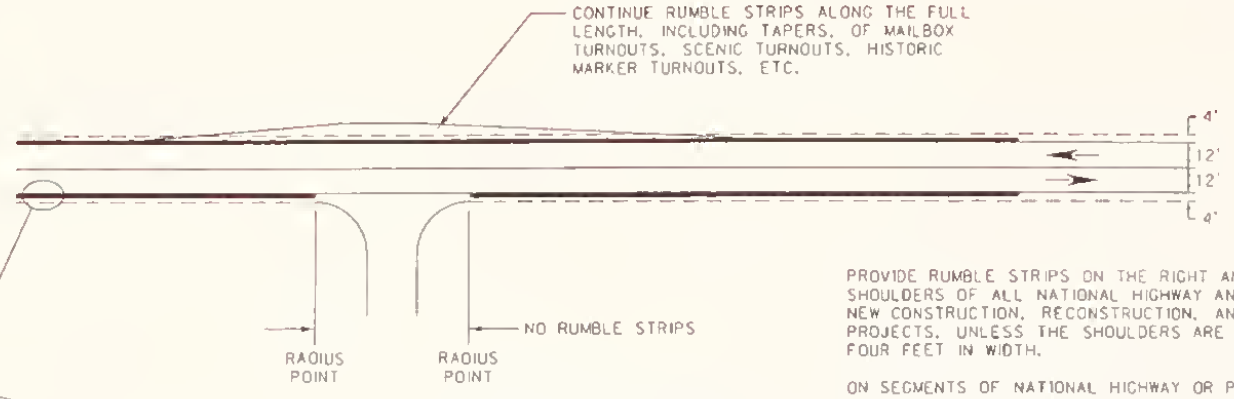


DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 208
DWG. NO.
208-80

WATER RESOURCE
PROTECTION
(W-02)

EFFECTIVE: AUGUST 1999

MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

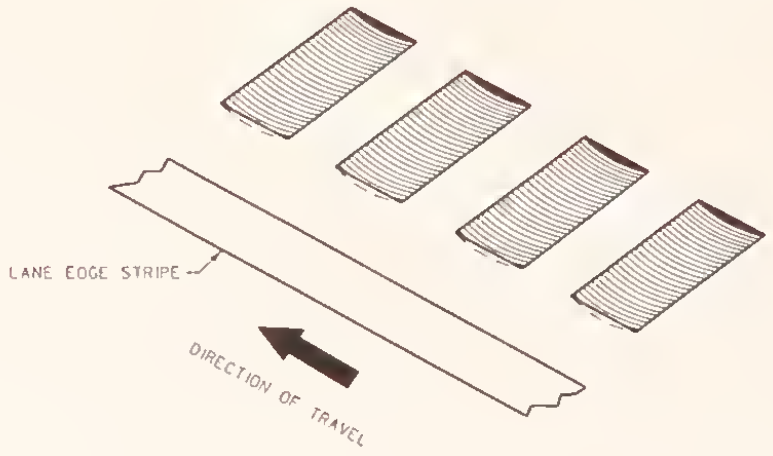


CONTINUE RUMBLE STRIPS ALONG THE FULL LENGTH, INCLUDING TAPERS, OF MAILBOX TURNOUTS, SCENIC TURNOUTS, HISTORIC MARKER TURNOUTS, ETC.

NATIONAL HIGHWAY ROUTE OR PRIMARY ROUTE APPLICATION

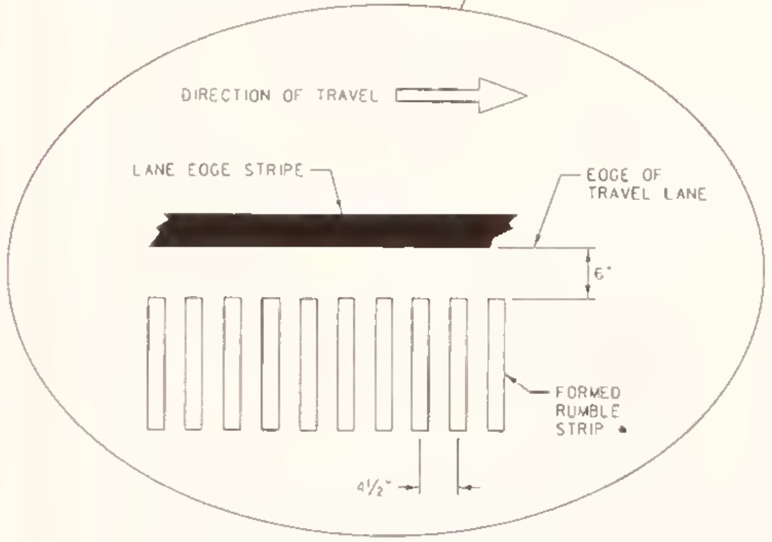
PROVIDE RUMBLE STRIPS ON THE RIGHT AND LEFT SHOULDERS OF ALL NATIONAL HIGHWAY AND PRIMARY NEW CONSTRUCTION, RECONSTRUCTION, AND OVERLAY PROJECTS, UNLESS THE SHOULDERS ARE LESS THAN FOUR FEET IN WIDTH.

ON SEGMENTS OF NATIONAL HIGHWAY OR PRIMARY ROUTES WITHIN DESIGNATED CITY OR URBAN LIMITS, USE ENGINEERING JUDGEMENT ON A CASE-BY-CASE BASIS TO DETERMINE IF RUMBLE STRIP INSTALLATION IS APPROPRIATE.

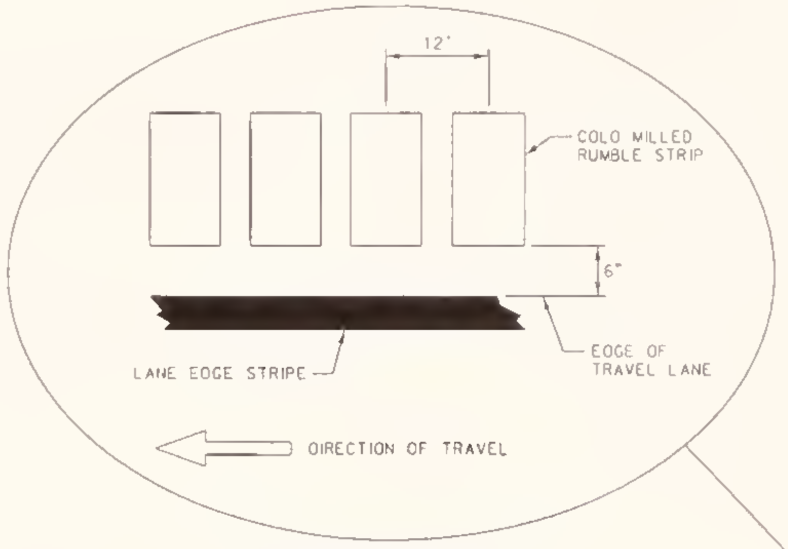


ISOMETRIC VIEW

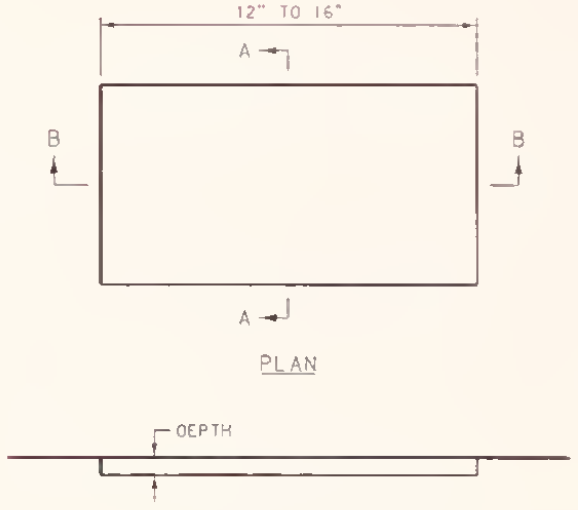
* DETERMINE THE METHOD OF INSTALLATION FOR RUMBLE STRIPS ON EXISTING CONCRETE SHOULDERS ON A CASE-BY-CASE BASIS.



TYPICAL SHOULDER INSTALLATION (CONCRETE PAVEMENT)

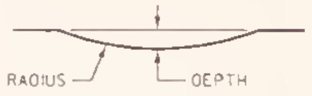


TYPICAL SHOULDER INSTALLATION (ASPHALT PAVEMENT)



PLAN

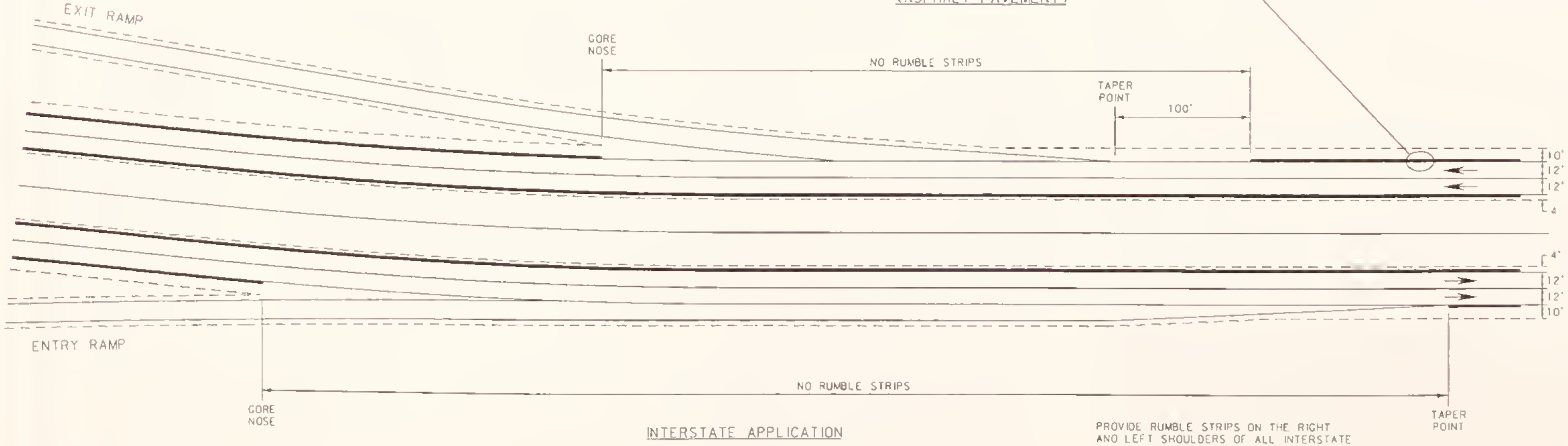
SECTION B-B



SECTION A-A

	DEPTH	RADIUS
CONCRETE	1"	1'
ASPHALT	½" TO ¾"	12"

RUMBLE STRIP DETAIL



INTERSTATE APPLICATION

PROVIDE RUMBLE STRIPS ON THE RIGHT AND LEFT SHOULDERS OF ALL INTERSTATE NEW CONSTRUCTION, RECONSTRUCTION, AND OVERLAY PROJECTS.

NOTES:

CONSTRUCT RUMBLE STRIPS IN ACCORDANCE WITH THE SPECIAL PROVISIONS OF THE PROJECT.

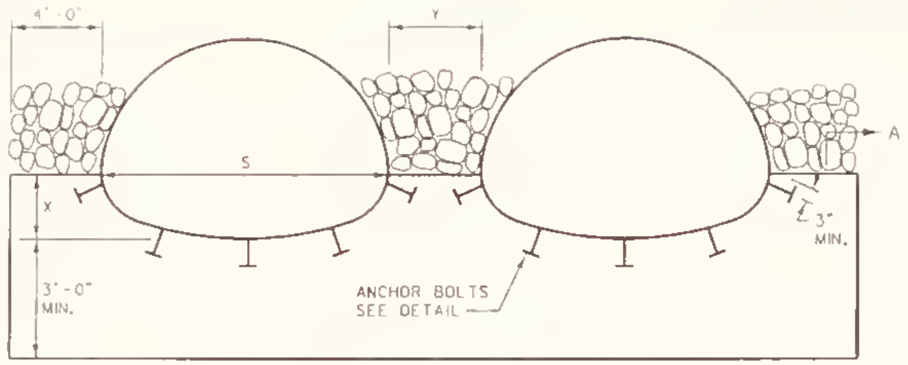
DO NOT INSTALL RUMBLE STRIPS OVER CONCRETE BRIDGE DECKS OR WHERE OBSTACLES, SUCH AS CONCRETE BARRIER RAIL, PREVENT PROPER PLACEMENT.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 411
DWG. NO.
411-02

CONTINUOUS SHOULDER RUMBLE STRIPS

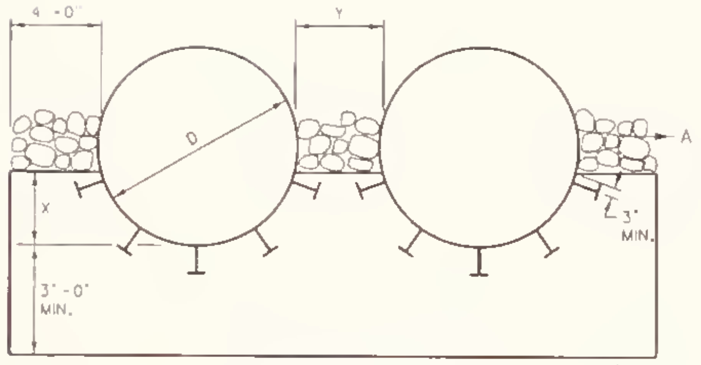
EFFECTIVE: AUGUST 1999

MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

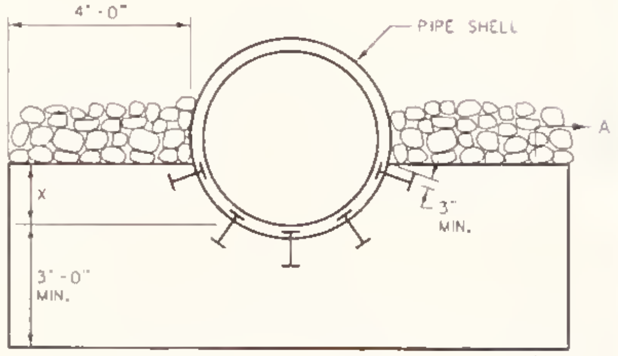


MULTIPLE ARCH CULVERTS
(METAL CULVERTS SHOWN)

X = VARIABLE (SEE DTL. DWG. NO. 603-10 FOR
CONCRETE CULV. AND 603-34 FOR METAL CULV.)
Y = 0.5S WITH A MIN. OF 4'-0" AND A MAX. OF
8'-0" (OUTSIDE WALL TO OUTSIDE WALL)

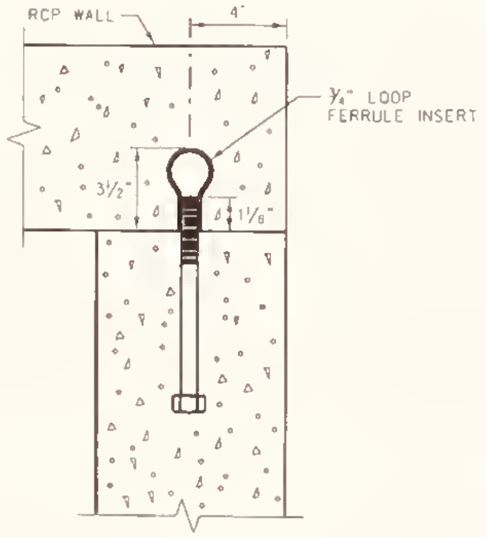


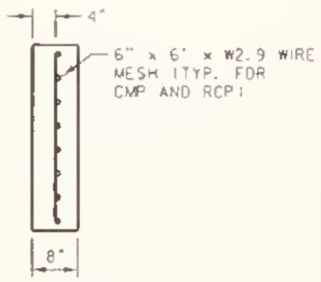
MULTIPLE ROUND CULVERTS
(METAL CULVERTS SHOWN)



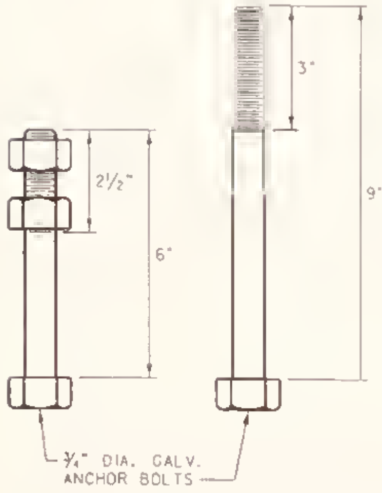
SINGLE ROUND CULVERT
(CONCRETE CULVERT SHOWN)

X = VARIABLE (SEE DTL. DWG. NO. 603-08 FOR
CONCRETE CULV. AND 603-34 FOR METAL CULV.)
Y = 0.5D WITH A MIN. OF 4'-0" AND A MAX. OF
8'-0" (OUTSIDE WALL TO OUTSIDE WALL)





SECTION A-A



ANCHOR BOLT DETAILS
6" LONG FOR METAL PIPE
9" LONG FOR CONCRETE PIPE

ANCHOR BOLT SPACING:
MIN. OF FIVE ¾" DIA. GALV. ANCHOR BOLTS
IN WALL. USE MAX. SPACING OF 1.5'.

NOTES:

USE CL. "DD" CONCRETE OR EQUAL.

SEE DTL. DWG. NO. 603-18 AND 603-20
FOR BEDDING UNDER CULVERTS.

SEE DTL. DWG. NO. 613-14 FOR RIPRAP.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 552
DWG. NO.
552-00

CONCRETE CUTOFF WALLS
FOR CULVERTS

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

DIAMETER OR SPAN x RISE	CUBIC YARDS OF CLASS DD CONCRETE (EACH END)										CUBIC YARDS OF RIPRAP (EACH END) ① (DTL. DWG. NO. 613-14)								C. Y. BEDDING MATERIAL ② PER L.F. OF PIPE (DTL. DWG. NO. 603-18)	
	CUTOFF WALL (DTL. DWG. NO. 552-00)		CONCRETE EDGE PROTECTION (DTL. DWG. NO. 613-08)																	
			1.5:1		2:1		2.5:1		3:1		1.5:1		2:1		2.5:1		3:1			
	SING.	DBL.	SING.	DBL.	SING.	DBL.	SING.	DBL.	SING.	DBL.	SING.	DBL.	SING.	DBL.	SING.	DBL.	SING.	DBL.	SING.	DBL.
RCP (SQ. END)																				
48"	1.1	1.8	2.1	3.1	2.6	3.7	3.1	4.4	3.5	5.1	7.7	12.1	9.6	15.0	11.5	18.1	13.6	21.3	0.9	1.8
54"	1.1	1.9	2.3	3.4	2.8	4.1	3.4	4.8	3.9	5.6	8.3	13.0	10.3	16.1	12.4	19.5	14.6	22.9	1.0	2.0
60"	1.2	2.0	2.6	3.7	3.1	4.5	3.7	5.3	4.3	6.1	8.8	13.9	11.0	17.3	13.3	20.9	15.6	24.6	1.1	2.2
66"	1.3	2.1	2.8	4.0	3.3	4.8	4.0	5.7	4.6	6.6	9.4	14.8	11.9	18.9	14.4	22.7	16.9	26.7	1.2	2.4
72"	1.3	2.2	3.0	4.3	3.6	5.2	4.3	6.2	5.0	7.2	10.2	16.1	12.6	20.0	15.2	24.1	17.9	28.3	1.3	2.6
78"	1.4	2.3	3.2	4.7	3.9	5.6	4.6	6.7	5.3	7.7	10.7	17.1	13.3	21.1	16.1	25.5	18.9	29.9	1.4	2.8
84"	1.4	2.4	3.4	5.0	6.1	6.0	4.3	7.1	5.7	8.3	11.3	18.6	14.0	22.3	16.9	26.9	19.9	31.6	1.5	3.0
84"	1.5	2.5	3.6	5.3	4.4	6.4	5.2	7.6	6.1	4.8	11.9	18.5	14.7	23.4	17.8	28.2	20.9	33.2	1.6	3.2
60"	1.6	2.6	3.8	5.5	6.1	6.1	5.5	6.1	6.1	9.4	12.5	19.8	15.5	24.6	18.6	29.6	21.4	34.9	1.4	3.0
RCPA (SQ. END)																				
58.50" x 36.00"	1.4	1.4	1.9	2.8	2.2	3.3	2.6	3.9	3.1	7.5	7.7	12.4	9.6	15.4	13.6	18.6	13.6	21.4	0.9	1.4
65.00" x 40.00"	1.2	1.4	2.0	3.0	2.4	4.8	2.9	4.3	3.3	4.9	8.3	19.4	10.3	16.6	12.4	20.1	13.6	23.6	0.9	1.4
73.00" x 45.00"	1.4	2.0	2.2	3.3	2.7	4.0	3.2	7.7	3.7	5.4	9.0	14.6	11.1	16.1	19.4	21.4	15.8	25.7	[illegible]	2.0
88.00" x 54.00"	1.4	2.2	2.6	4.0	3.2	4.8	3.7	5.6	3.3	6.5	10.5	17.3	13.0	21.4	15.7	25.8	18.5	30.3	1.4	2.2
102.00" x 62.00"	1.4	2.4	3.3	4.8	3.3	5.5	4.3	6.5	5.0	7.5	11.9	19.6	14.7	24.3	17.7	29.2	20.8	34.4	~	~
115.00" x 72.00"	1.5	2.8	3.3	6.1	4.0	6.1	4.8	7.2	5.5	8.4	12.9	21.5	16.1	26.7	19.4	32.1	22.8	37.8	~	~
122.00" x 77.25"	1.4	2.7	3.3	5.5	4.3	6.6	5.1	7.8	6.0	9.1	13.8	23.0	17.1	28.5	20.7	34.4	22.3	40.4	~	~
138.00" x 87.13"	1.7	2.8	6.1	6.2	4.8	7.5	5.8	8.9	6.8	10.4	15.5	25.9	19.2	32.1	23.2	38.7	27.2	45.5	~	~
154.00" x 96.88"	1.8	3.0	4.5	6.1	5.5	8.5	6.5	10.1	7.6	11.7	17.2	23.0	21.4	36.0	25.8	43.3	30.3	50.9	~	~
168.75" x 106.50"	2.4	3.3	4.9	7.6	5.3	9.2	7.0	10.9	8.1	12.6	19.4	31.2	22.8	38.7	21.5	46.6	32.4	54.7	~	~
RCP (FETS)																				
84"	1.5	2.2	~	~	~	~	~	~	3.7	5.3	~	~	~	~	~	~	16.7	25.9	0.9	1.4
84"	1.4	2.4	~	~	~	~	~	~	3.0	6.8	~	~	~	~	~	~	16.1	27.7	1.4	2.4
60"	1.7	2.8	~	~	3.3	6.1	~	~	~	~	~	~	12.9	20.0	~	~	~	~	1.4	2.4
72"	1.4	2.7	~	~	3.8	5.3	~	~	~	~	~	~	14.8	23.1	~	~	~	~	1.4	2.8
84"	1.4	2.8	3.3	6.1	~	~	~	~	~	~	15.1	23.6	~	~	~	~	~	~	1.4	2.8
RCPA (FETS)																				
48"	1.4	2.2	~	~	~	~	~	~	3.0	4.4	~	~	~	~	~	~	14.2	21.5	0.9	1.7
54"	1.5	2.3	~	~	~	~	~	~	3.2	4.6	~	~	~	~	~	~	15.1	23.1	0.9	1.9
60"	1.7	2.5	~	~	~	~	~	~	3.3	4.8	~	~	~	~	~	~	15.9	24.7	1.0	2.0
72"	1.8	2.7	~	~	3.3	4.9	~	~	~	~	~	~	14.2	22.6	~	~	~	~	1.1	2.2

NOTES:

① QUANTITIES ARE BASED ON A THICKNESS OF 2 FT. AND ARE PROPORTIONED WHEN A DIFFERENT THICKNESS IS SPECIFIED.

② QUANTITIES ARE BASED ON NO. 3 FOUNDATION STABILIZATION WITH A WIDTH EQUAL TO (DIAMETER OR SPAN) + 4 FT. + 12 TIMES SHELL THICKNESS FOR CONCRETE OR 4" FOR METAL) AND A DEPTH EQUAL TO 2 FT. PLUS "X". TO COMPUTE THE TOTAL BEDDING QUANTITY MULTIPLY BY (LENGTH OF PIPE MINUS 24 FEET).

SEE DTL. DWG. NO. 603-18 FOR DEFINITION OF NO. 3 FOUNDATION STABILIZATION AND "X" DIMENSION.

FOR PIPES WITH SKEW BEVEL ENDS - DIVIDE THE QUANTITIES SHOWN BY COSINE OF SKEW ANGLE.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 552, 603, 613
DWG. NO.
552-04

CONCRETE, RIPRAP AND BEDDING
MATERIAL QUANTITIES FOR SING.
AND DBL. CULVERT INSTALLATION

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

DIAMETER OR SPAN × RISE	CUBIC YARDS OF CLASS DD CONCRETE (EACH END)										CUBIC YARDS OF RIPRAP (EACH END) ① (DTL. DWG. NO. 613-14)								C. Y. BEDDING MATERIAL ② PER L.F. OF PIPE (DTL. DWG. NO. 603-18)	
	CUTOFF WALL (DTL. DWG. NO. 552-00)		CONCRETE EDGE PROTECTION (DTL. DWG. NO. 613-08)																	
			1.5:1		2:1		2.5:1		3:1		1.5:1		2:1		2.5:1		3:1			
	SING.	DBL.	SING.	DBL.	SING.	DBL.	SING.	DBL.	SING.	DBL.	SING.	DBL.	SING.	DBL.	SING.	DBL.	SING.	DBL.	SING.	DBL.
SSPPA 6" × 2" CORRUGATIONS 18" CORNER RADIUS																				
6'-1" × 4'-7"	1.5	2.5	1.8	2.8	2.2	3.3	2.5	3.8	~	~	7.8	12.8	9.7	15.9	11.7	19.2	~	~	1.2	2.4
6'-4" × 4'-9"	1.5	2.5	2.0	3.0	2.4	3.6	2.8	4.2	~	~	8.4	13.7	10.4	17.0	12.5	20.5	~	~	1.2	2.3
6'-9" × 4'-11"	1.6	2.7	2.0	3.0	2.3	3.6	2.7	4.2	~	~	8.4	13.8	10.4	17.1	12.5	20.7	~	~	1.3	2.5
7'-0" × 5'-1"	1.6	2.7	2.1	3.2	2.5	3.8	2.9	4.4	~	~	8.8	14.5	10.9	18.0	13.2	21.7	~	~	1.2	2.5
7'-3" × 5'-3"	1.6	2.6	2.2	3.4	2.7	4.1	3.2	4.8	~	~	9.3	15.4	11.6	19.1	14.0	23.0	~	~	1.2	2.5
7'-8" × 5'-5"	1.7	2.8	2.3	3.5	2.7	4.1	3.2	4.9	~	~	9.5	15.7	11.8	19.5	14.2	23.5	~	~	1.3	2.7
7'-11" × 5'-7"	1.7	2.8	2.4	3.6	2.8	4.3	3.3	5.1	~	~	9.8	16.2	12.2	20.1	14.7	24.3	~	~	1.3	2.6
8'-2" × 5'-9"	1.6	2.8	2.5	3.8	3.0	4.6	3.6	5.4	~	~	10.3	17.1	12.8	21.2	15.5	25.6	~	~	1.3	2.6
8'-7" × 5'-11"	1.7	2.9	2.5	3.9	3.1	4.7	3.6	5.5	~	~	10.5	17.5	13.0	21.7	15.7	26.1	~	~	1.4	2.8
8'-10" × 6'-1"	1.7	2.9	2.7	4.1	3.2	4.9	3.8	5.8	~	~	10.9	18.2	13.6	22.5	16.3	27.2	~	~	1.4	2.8
9'-4" × 6'-3"	1.8	3.1	2.7	4.1	3.2	5.0	3.8	5.8	~	~	11.0	18.4	13.6	22.8	16.4	27.5	~	~	1.5	3.0
9'-6" × 6'-5"	1.8	3.1	2.8	4.4	3.4	5.2	4.0	6.2	~	~	11.5	19.3	14.3	23.9	17.2	28.8	~	~	1.5	2.9
9'-9" × 6'-7"	1.8	3.1	3.0	4.5	3.6	5.5	4.2	6.4	~	~	11.9	20.0	14.8	24.7	17.9	29.8	~	~	1.4	2.9
10'-3" × 6'-9"	1.9	3.2	3.0	4.7	3.6	5.6	4.3	6.6	~	~	12.2	20.4	15.1	25.3	18.2	30.5	~	~	1.6	3.1
10'-8" × 6'-11"	2.0	3.5	3.0	4.7	3.6	5.6	4.2	6.6	~	~	12.1	20.4	15.0	25.3	18.1	30.6	~	~	1.7	3.4
10'-11" × 7'-1"	1.9	3.9	3.1	4.9	3.8	5.9	4.3	6.9	~	~	12.7	21.3	15.7	26.5	10.4	41.9	~	~	1.9	3.4
11'-5" × 7'-3"	2.4	3.6	3.2	5.0	3.8	6.0	4.9	7.0	~	~	12.9	21.8	16.0	27.0	19.3	32.6	~	~	1.9	3.6
11'-7" × 7'-5"	2.4	3.6	3.9	5.2	5.0	6.2	4.3	7.3	~	~	13.3	22.5	10.4	28.6	10.4	33.7	~	~	1.9	3.5
11'-10" × 7'-7"	1.9	3.5	3.9	5.4	4.3	6.5	5.0	7.7	~	~	43.9	23.5	17.2	25.1	20.8	35.1	~	~	1.1	3.4
12'-4" × 7'-9"	2.2	1.9	3.5	5.6	4.3	6.6	5.0	7.8	~	~	17.0	23.7	17.3	25.4	20.3	35.5	~	~	1.9	3.7
12'-6" × 7'-11"	4.3	3.4	3.9	5.0	4.3	4.3	5.2	8.1	~	~	10.4	23.5	17.9	30.4	21.6	36.6	~	~	1.9	1.9
12'-8" × 8'-1"	2.1	3.4	3.6	5.0	4.6	7.1	5.4	9.0	~	~	15.0	25.4	10.4	31.5	22.3	41.9	~	~	1.9	3.6
14'-10" × 9'-1"	2.4	3.9	3.9	6.1	5.0	7.4	5.6	9.0	~	~	15.5	26.3	10.4	32.6	23.2	39.2	~	~	4.7	3.5
13'-5" × 8'-5"	2.2	3.9	3.9	6.2	4.3	7.4	5.6	8.8	~	~	15.5	26.4	19.3	32.8	23.2	35.5	~	~	1.5	1.9
13'-11" × 8'-7"	4.3	4.3	5.0	6.3	4.8	7.6	5.7	9.0	~	~	15.8	27.0	10.4	33.5	23.6	10.4	~	~	1.9	1.9
14'-1" × 8'-9"	4.3	3.0	4.1	6.5	5.0	7.8	5.4	9.2	~	~	16.8	27.7	20.2	34.4	24.3	41.9	~	~	2.0	1.9
14'-3" × 8'-11"	4.3	1.9	4.3	6.7	5.2	8.1	6.1	9.0	~	~	16.8	28.6	20.3	35.5	25.1	42.8	~	~	1.9	1.9
14'-10" × 9'-1"	1.9	1.2	4.3	4.3	5.2	4.3	4.3	9.7	~	~	17.0	29.0	21.0	36.0	25.4	43.9	~	~	2.7	4.2
15'-4" × 9'-2"	2.5	2.5	4.3	4.3	5.2	8.3	4.3	9.0	~	~	17.1	29.4	21.2	36.4	25.6	43.9	~	~	2.2	1.9
15'-6" × 9'-5"	2.5	1.9	5.0	4.3	5.4	5.0	4.3	10.2	~	~	17.7	30.4	22.0	37.7	26.5	45.4	~	~	2.4	1.9
15'-8" × 9'-7"	2.4	4.3	4.3	4.3	5.6	8.3	6.7	10.6	~	~	18.3	31.3	22.7	33.5	27.3	46.8	~	~	2.2	4.3
15'-10" × 9'-9"	1.9	4.3	5.0	7.6	5.6	9.2	4.3	10.4	~	~	18.7	32.0	23.2	39.7	28.6	41.9	~	~	2.7	4.2
16'-5" × 9'-11"	2.0	4.5	5.0	7.7	5.6	9.3	4.3	11.0	~	~	18.9	32.5	23.4	40.9	28.3	48.6	~	~	4.3	1.9
16'-7" × 10'-1"	2.5	4.5	5.0	5.0	6.1	9.6	7.2	10.4	~	~	19.5	33.4	21.2	41.5	29.1	50.0	~	~	2.4	1.9
SSPPA 6" × 2" CORRUGATIONS 31" CORNER RADIUS																				
12'-8" × 8'-1"	2.5	4.3	3.8	6.0	5.0	7.3	5.5	8.6	~	~	15.1	25.7	10.4	32.6	22.6	38.5	~	~	2.2	3.4
13'-6" × 9'-6"	2.5	4.3	4.0	6.2	4.3	7.5	5.6	8.9	~	~	15.6	26.5	10.4	32.8	23.3	33.7	~	~	4.3	2.3
14'-0" × 9'-8"	2.8	4.5	5.0	8.9	4.8	7.2	5.0	8.3	~	~	15.8	27.0	10.4	33.5	23.6	10.4	~	~	4.3	1.9
14'-3" × 9'-10"	2.0	1.9	4.2	6.6	5.0	9.0	4.3	9.0	~	~	10.4	29.0	20.4	34.7	25.5	41.9	~	~	2.2	1.5
14'-5" × 10'-0"	2.5	4.3	4.3	9.0	5.2	8.2	6.2	9.7	~	~	16.8	28.7	20.9	35.6	25.2	42.8	~	~	2.2	1.9
14'-11" × 10'-2"	2.7	7.6	4.3	9.0	5.2	9.0	4.3	9.0	~	~	17.0	29.1	21.1	36.1	25.4	43.9	~	~	2.3	4.7
15'-4" × 10'-4"	2.8	4.5	4.3	6.9	5.2	8.4	4.3	8.8	~	~	17.1	29.4	21.2	36.5	25.6	44.0	~	~	2.5	1.9
15'-7" × 10'-6"	1.9	1.9	5.0	7.2	5.9	8.1	4.3	10.3	~	~	17.7	30.4	22.0	37.7	26.5	35.5	~	~	2.4	1.9
15'-10" × 10'-8"	2.3	1.9	4.3	11.5	5.7	3.0	4.3	10.6	~	~	18.3	31.4	22.7	38.9	27.4	46.9	~	~	2.4	1.9
16'-3" × 10'-10"	2.9	5.5	4.3	7.2	5.4	9.0	6.7	10.7	~	~	18.3	31.6	22.8	39.2	27.7	11.3	~	~	2.5	5.1
16'-6" × 11'-0"	2.8	5.0	4.9	7.2	5.9	9.6	4.3	11.1	~	~	18.9	32.6	29.5	40.4	28.3	48.7	~	~	2.5	5.0
17'-0" × 11'-2"	1.9	5.2	4.9	7.8	5.9	5.0	4.3	11.2	~	~	19.1	32.9	23.7	40.9	29.5	49.3	~	~	2.4	5.3
17'-2" × 11'-4"	2.0	5.2	5.0	8.1	4.3	5.0	4.3	11.9	~	~	19.6	33.4	24.3	41.9	20.3	50.5	~	~	2.6	5.0
17'-5" × 11'-6"	2.3	5.1	5.2	9.0	6.3	10.0	3.9	11.9	~	~	20.2	34.8	25.0	43.2	30.2	52.0	~	~	2.6	5.2
17'-11" × 11'-8"	1.9	5.3	5.3	9.0	6.4	10.2	7.6	12.1	~	~	20.4	35.4	25.4	43.9	30.6	52.9	~	~	2.4	5.5
18'-1" × 11'-10"	3.0	5.3	5.4	9.0	6.5	10.5	7.8	12.4	~	~	20.9	36.2	26.0	44.9	31.3	54.1	~	~	2.7	5.4
18'-7" × 12'-0"	1.1	5.5	5.0	8.8	6.6	10.6	7.6	12.5	~	~	21.1	36.6	26.2	45.4	34.6	54.8	~	~	2.4	5.7
18'-9" × 12'-2"	3.1	5.5	5.6	9.0	6.8	10.9	8.1	12.9	~	~	21.7	37.6	26.9	46.7	32.5	56.3	~	~	2.8	5.6
19'-3" × 12'-4"	3.2	5.7	5.6	9.2	6.8	11.0	8.1	13.0	~	~	21.9	38.1	27.2	47.3	32.8	56.9	~	~	3.0	5.9
19'-6" × 12'-6"	3.2	5.7	5.8	9.4	7.1	11.4	8.4	13.5	~	~	22.5	39.1	28.0	48.6	33.7	58.5	~	~	2.9	5.8
19'-8" × 12'-8"	3.2	5.6	6.0	9.6	7.2	11.6	8.6	13.8	~	~	23.0	40.0	28.6	49.6	34.4	59.8	~	~	2.9	5.8
19'-11" × 12'-10"	3.1	5.6	6.1	9.9	7.4	12.0	8.8	14.2	~	~	23.6	40.9	29.3	50.8	35.3	61.2	~	~	2.8	5.7
20'-5" × 13'-0"	3.3	5.8	6.2	10.0	7.5	12.1	8.9	14.3	~	~	23.8	41.5	29.6	51.5	35.6	62.0	~	~	3.0	6.0
20'-7" × 13'-2"	3.2	5.8	6.3	10.2	7.7	12.4	9.1	14.6	~	~	24.3	42.3	30.2	52.5	36.4	63.2	~	~	3.0	5.9

NOTES:

① QUANTITIES ARE BASED ON A THICKNESS OF 2 FT. AND ARE PROPORTIONED WHEN A DIFFERENT THICKNESS IS SPECIFIED.

② QUANTITIES ARE BASED ON NO. 3 FOUNDATION STABILIZATION WITH A WIDTH EQUAL TO (DIAMETER OR SPAN) + 4 FT. + 12 TIMES SHELL THICKNESS FOR CONCRETE OR 4" FOR METAL) AND A DEPTH EQUAL TO 2 FT. PLUS "X". TO COMPUTE THE TOTAL BEDDING QUANTITY MULTIPLY BY (LENGTH OF PIPE MINUS 24 FEET).

SEE DTL. DWG. NO. 603-18 FOR DEFINITION OF NO. 3 FOUNDATION STABILIZATION AND "X" DIMENSION.

FOR PIPES WITH SKEW BEVEL ENDS - DIVIDE THE QUANTITIES SHOWN BY COSINE OF SKEW ANGLE.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 552, 603, 613
DWG. NO.
552-06

CONCRETE, RIPRAP AND BEDDING
MATERIAL QUANTIES FOR SING.
AND DBL. CULVERT INSTALLATION

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT
OF TRANSPORTATION
MONTANA
CADD

DIAMETER OR SPAN × RISE	CUBIC YARDS OF CLASS DD CONCRETE (EACH END)										CUBIC YARDS OF RIPRAP (EACH END) ① (DTL. DWG. NO. 613-14)								C. Y. BEDDING MATERIAL ② PER L.F. OF PIPE (DTL. DWG. NO. 603-18)	
	CUTOFF WALL (DTL. DWG. NO. 552-00)		CONCRETE EDGE PROTECTION (DTL. DWG. NO. 613-08)																	
			1.5:1		2:1		2.5:1		3:1		1.5:1		2:1		2.5:1		3:1			
	SING.	DBL.	SING.	DBL.	SING.	DBL.	SING.	DBL.	SING.	DBL.	SING.	DBL.	SING.	DBL.	SING.	DBL.	SING.	DBL.	SING.	DBL.
CSP AND SSPP ALL CORRUGATIONS																				
54"	1.2	2.0	2.1	3.0	2.5	3.6	~	~	~	~	8.3	13.3	10.3	16.5	~	~	~	~	0.9	1.8
60"	1.3	2.1	2.2	3.3	2.7	4.0	~	~	~	~	8.9	14.3	11.1	17.8	~	~	~	~	1.0	2.0
66"	1.3	2.2	2.4	3.6	2.9	4.3	~	~	~	~	9.6	15.4	11.9	19.1	~	~	~	~	1.0	2.1
72"	1.4	2.4	2.6	3.9	3.2	4.6	~	~	~	~	10.2	16.4	12.7	20.4	~	~	~	~	1.1	2.3
78"	1.5	2.5	2.8	4.1	3.4	5.0	~	~	~	~	10.8	17.5	13.4	21.7	~	~	~	~	1.2	2.4
84"	1.6	2.7	3.0	4.4	3.6	5.3	~	~	~	~	11.5	18.6	14.2	23.1	~	~	~	~	1.3	2.6
90"	1.9	2.8	3.2	9.0	3.8	9.0	~	~	~	~	12.1	19.7	15.3	25.5	~	~	~	~	1.9	2.3
96"	4.7	1.9	4.3	9.0	9.1	9.1	~	~	~	~	13.0	21.2	16.1	26.3	~	~	~	~	1.5	2.5
102"	1.9	3.1	3.6	5.3	5.0	9.0	~	~	~	~	13.6	22.3	16.9	27.7	~	~	~	~	1.9	1.9
108"	1.9	2.3	3.8	9.0	7.2	9.0	~	~	~	~	11.3	23.5	17.8	29.1	~	~	~	~	1.9	1.9
102"	2.0	1.9	5.0	6.0	7.2	7.2	~	~	~	~	15.0	24.8	18.6	30.6	~	~	~	~	1.9	1.9
120"	2.7	1.9	4.3	9.0	9.1	7.2	~	~	~	~	15.7	25.2	14.5	32.0	~	~	~	~	1.9	1.9
126"	2.1	4.7	4.3	9.0	5.3	9.0	~	~	~	~	10.4	22.0	20.3	33.5	~	~	~	~	1.9	1.9
132"	2.2	1.9	4.6	9.0	5.6	8.6	~	~	~	~	17.1	28.2	21.2	35.0	~	~	~	~	1.9	1.9
96"	1.9	1.9	5.0	7.2	9.0	9.0	~	~	~	~	11.5	29.5	22.1	36.5	~	~	~	~	2.7	4.2
144"	2.4	4.2	5.0	7.6	9.1	9.2	~	~	~	~	18.5	30.7	24.0	38.1	~	~	~	~	2.2	1.1
150"	2.5	1.9	5.2	7.2	9.0	9.0	~	~	~	~	10.4	32.0	29.5	39.7	~	~	~	~	1.9	1.9
156"	2.0	2.0	5.0	9.2	6.6	10.4	~	~	~	~	20.6	33.3	24.8	41.2	~	~	~	~	2.4	1.9
132"	2.4	4.7	5.6	8.6	9.0	10.4	~	~	~	~	20.6	34.6	25.7	42.8	~	~	~	~	2.5	5.0
108"	2.8	1.9	5.0	9.0	7.1	10.4	~	~	~	~	21.5	35.9	26.7	44.5	~	~	~	~	2.6	5.2
100"	2.9	5.0	4.3	9.3	7.4	11.3	~	~	~	~	22.3	37.2	27.6	46.1	~	~	~	~	2.7	5.4
180"	3.9	5.3	6.3	9.6	7.7	11.7	~	~	~	~	23.0	30.5	28.6	17.8	~	~	~	~	2.4	5.4
186"	3.1	5.0	4.3	10.4	7.9	12.1	~	~	~	~	23.6	33.5	29.5	49.5	~	~	~	~	2.9	5.9
192"	3.2	5.6	6.7	10.4	9.2	12.6	~	~	~	~	24.8	41.3	30.5	51.2	~	~	~	~	3.9	5.1
132"	4.3	5.0	4.3	10.7	8.5	13.0	~	~	~	~	25.4	42.7	31.5	52.9	~	~	~	~	3.2	6.3
204"	4.3	6.0	4.3	11.1	9.0	10.4	~	~	~	~	25.2	44.1	32.6	54.7	~	~	~	~	2.3	2.0
210"	4.5	6.8	4.3	11.5	9.1	10.4	~	~	~	~	27.0	45.5	33.5	56.4	~	~	~	~	4.3	6.8
210"	3.9	6.4	7.7	11.9	9.0	10.4	~	~	~	~	27.4	46.9	34.5	58.2	~	~	~	~	1.9	1.9
204"	3.9	6.8	4.3	12.6	9.0	10.4	~	~	~	~	29.5	40.9	36.6	61.8	~	~	~	~	3.8	7.5
240"	2.0	7.2	8.6	13.4	10.5	40.9	~	~	~	~	31.2	52.9	30.7	65.6	~	~	~	~	1.9	1.9
252"	2.2	7.6	4.3	14.2	17.1	11.3	~	~	~	~	32.9	55.9	40.8	69.3	~	~	~	~	4.3	2.0
CSPA 2⅔" × ½" CORRUGATIONS																				
49" × 33"	1.1	1.9	1.4	2.1	1.7	2.5	~	~	~	~	6.3	10.1	7.2	12.6	~	~	~	~	5.8	1.9
57" × 38"	1.2	1.9	1.6	2.1	1.4	2.0	~	~	~	~	6.3	11.1	8.5	10.4	~	~	~	~	0.9	1.9
64" × 43"	1.3	2.4	1.7	2.9	2.0	4.3	~	~	~	~	1.4	12.6	9.2	15.0	~	~	~	~	5.8	1.9
71" × 47"	1.3	2.2	4.8	2.8	2.2	4.3	~	~	~	~	7.9	12.8	9.8	16.0	~	~	~	~	1.9	2.1
77" × 52"	1.1	2.3	2.0	3.5	2.9	3.6	~	~	~	~	8.4	13.7	10.4	17.0	~	~	~	~	1.1	2.2
83" × 57"	1.5	2.0	2.1	3.2	2.6	3.9	~	~	~	~	6.3	14.6	17.0	38.7	~	~	~	~	1.2	1.9
CSPA 3" × 1" CORRUGATIONS																				
40" × 31"	1.9	1.9	1.3	1.4	3.9	2.9	~	~	~	~	5.8	9.2	7.2	11.4	~	~	~	~	0.9	1.5
46" × 36"	4.2	1.9	4.3	2.1	4.3	2.5	~	~	~	~	6.3	10.4	7.2	12.4	~	~	~	~	0.9	1.9
53" × 41"	1.2	2.0	4.6	2.9	1.4	2.9	~	~	~	~	9.0	10.4	9.0	10.4	~	~	~	~	0.9	1.9
60" × 46"	1.1	2.2	1.7	2.5	2.0	3.0	~	~	~	~	7.2	11.7	9.0	14.5	~	~	~	~	1.9	2.0
66" × 51"	1.9	2.3	1.4	2.8	2.2	3.9	~	~	~	~	7.7	12.6	7.2	10.4	~	~	~	~	1.9	2.4
73" × 55"	4.5	2.5	2.9	2.9	2.9	3.9	~	~	~	~	9.0	10.4	40.9	10.4	~	~	~	~	1.2	2.5
81" × 59"	1.5	2.5	2.2	4.3	2.6	3.9	~	~	~	~	9.1	14.8	17.2	10.4	~	~	~	~	1.2	2.4
81" × 59"	1.9	2.7	2.9	3.9	2.0	3.2	~	~	~	~	9.6	15.7	11.9	14.5	~	~	~	~	1.9	2.6
95" × 67"	1.7	2.3	2.1	4.3	2.9	5.0	~	~	~	~	10.0	18.6	12.5	20.6	~	~	~	~	1.9	2.4
103" × 71"	1.9	4.6	2.9	5.0	4.3	7.7	~	~	~	~	10.4	17.9	13.1	27.4	~	~	~	~	1.9	3.9
112" × 75"	1.9	3.8	2.1	3.2	3.9	5.0	~	~	~	~	11.1	10.4	13.8	22.9	~	~	~	~	1.9	3.2
117" × 79"	2.0	1.9	2.9	4.3	3.4	5.3	~	~	~	~	11.6	10.4	14.4	24.1	~	~	~	~	4.7	1.9
128" × 83"	2.1	3.5	3.0	4.7	3.6	5.6	~	~	~	~	12.1	20.3	15.1	25.2	~	~	~	~	1.8	3.7
137" × 87"	2.2	3.7	3.2	4.9	3.8	5.9	~	~	~	~	12.7	21.3	15.7	26.5	~	~	~	~	2.0	3.9
142" × 91"	2.2	3.9	3.3	5.2	4.0	6.2	~	~	~	~	13.2	22.3	16.4	27.7	~	~	~	~	2.1	4.2

NOTES:

① QUANTITIES ARE BASED ON A THICKNESS OF 2 FT. AND ARE PROPORTIONED WHEN A DIFFERENT THICKNESS IS SPECIFIED.

② QUANTITIES ARE BASED ON NO. 3 FOUNDATION STABILIZATION WITH A WIDTH EQUAL TO (DIAMETER OR SPAN) + 4 FT. + (2 TIMES SHELL THICKNESS FOR CONCRETE OR 4" FOR METAL) AND A DEPTH EQUAL TO 2 FT. PLUS "X". TO COMPUTE THE TOTAL BEDDING QUANTITY MULTIPLY BY (LENGTH OF PIPE MINUS 24 FEET).

SEE DTL. DWG. NO. 603-18 FOR DEFINITION OF NO. 3 FOUNDATION STABILIZATION AND "X" DIMENSION.

FOR PIPES WITH SKEW BEVEL ENDS - DIVIDE THE QUANTITIES SHOWN BY COSINE OF SKEW ANGLE.

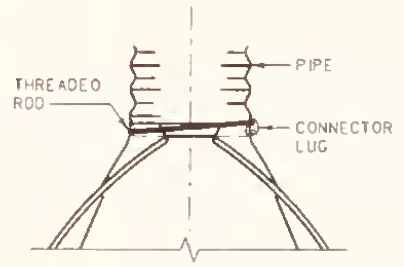
DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 552, 603, 613
DWG. NO.
552-08

CONCRETE, RIPRAP AND BEDDING
MATERIAL QUANTITIES FOR SING.
AND DBL. CULVERT INSTALLATION

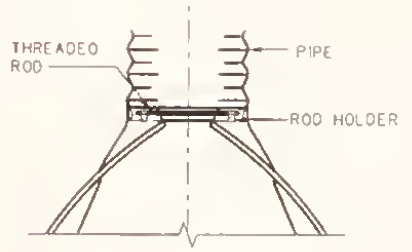
EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT
OF TRANSPORTATION
MONTANA
CADD

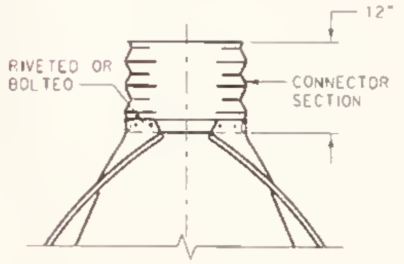
CONNECTIONS



TYPE 1

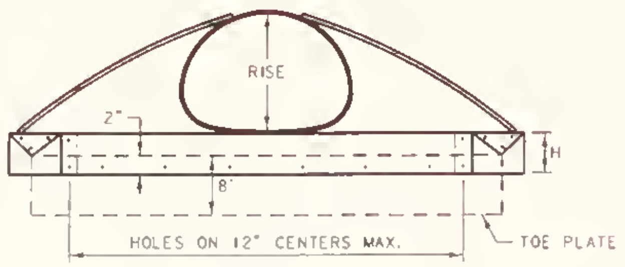


TYPE 2

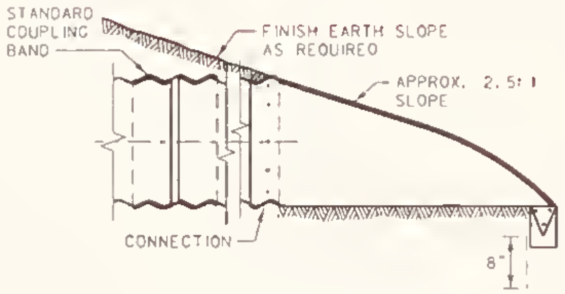


TYPE 3

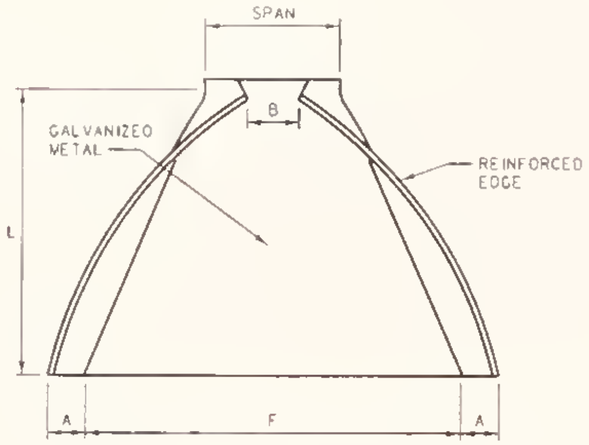
ARCH PIPE



ELEVATION



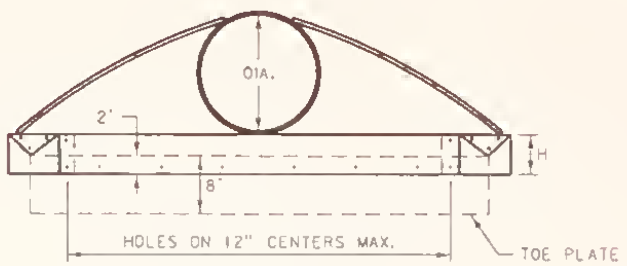
TYPICAL CROSS-SECTION
(ILLUSTRATED WITH TYPE 3 CONNECTION)



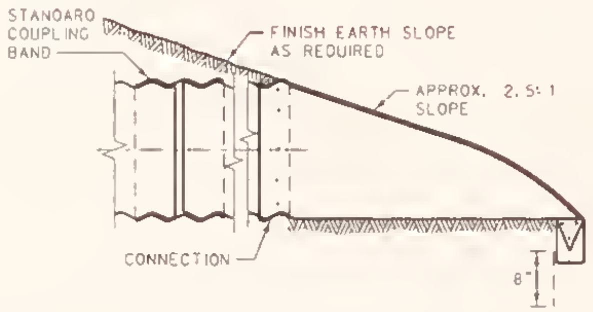
PLAN

3" × 1" CORR.	MINIMUM THICKNESS	2⅔" × ½" CORR.	MINIMUM THICKNESS	DIMENSIONS					TYPE CONNECTOR
SPAN × RISE		SPAN × RISE		A 1" TOL.	B MAX.	H 1" TOL.	L 1½" TOL.	F 2" TOL.	
		17" × 13"	0.064"	7"	9"	6"	19"	30"	2
		21" × 15"	0.064"	7"	10"	6"	23"	30"	2
		24" × 18"	0.064"	8"	12"	6"	28"	42"	2
		28" × 20"	0.064"	9"	14"	6"	32"	48"	2
		35" × 24"	0.079"	10"	16"	6"	39"	60"	2
40" × 31"	0.079"	42" × 29"	0.079"	12"	18"	8"	46"	75"	3
46" × 36"	0.109"	49" × 33"	0.109"	13"	21"	9"	53"	85"	3
53" × 41"	0.109"	57" × 38"	0.109"	18"	26"	12"	63"	90"	3
60" × 46"	0.109"	64" × 43"	0.109"	18"	30"	12"	70"	102"	3
66" × 51"	0.109"	71" × 47"	0.109"	18"	33"	12"	77"	114"	3
73" × 55"	0.109"	77" × 52"	0.109"	18"	36"	12"	77"	126"	3
81" × 59"	0.109"	83" × 57"	0.109"	18"	36"	12"	77"	138"	3

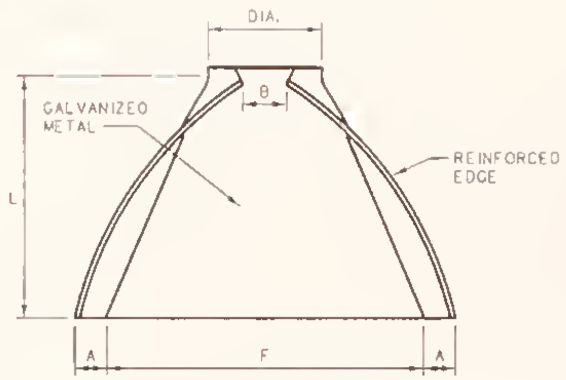
ROUND PIPE



ELEVATION



TYPICAL CROSS-SECTION
(ILLUSTRATED WITH TYPE 3 CONNECTION)



PLAN

PIPE DIA.	MINIMUM THICKNESS	DIMENSIONS					TYPE CONNECTOR
		A 1" TOL.	B MAX.	H 1" TOL.	L 1½" TOL.	F 2" TOL.	
12"	0.064"	6"	6"	6"	21"	24"	1
15"	0.064"	7"	8"	6"	26"	30"	1
18"	0.064"	8"	10"	6"	31"	36"	1
21"	0.064"	9"	12"	6"	36"	42"	1
24"	0.064"	10"	13"	6"	41"	48"	1
30"	0.079"	12"	16"	8"	51"	60"	2
36"	0.079"	14"	19"	9"	60"	72"	2
42"	0.109"	16"	22"	11"	69"	84"	3
48"	0.109"	18"	27"	12"	78"	90"	3
54"	0.109"	18"	30"	12"	84"	102"	3
60"	0.109"	18"	33"	12"	87"	114"	3
66"	0.109"	18"	36"	12"	87"	120"	3
72"	0.109"	18"	39"	12"	87"	126"	3
78"	0.109"	18"	42"	12"	87"	132"	3
84"	0.109"	18"	45"	12"	87"	138"	3

NOTES:

PROVIDE TOE PLATE WHEN SPECIFIED.

GALVANIZE ALL PARTS IN ACCORDANCE WITH AASHTO M 36.

PAINT ANY AREAS WHERE GALVANIZING IS BROKEN OR METAL IS BARE WITH ONE COAT OF ZINC CHROMATE PRIME AND TWO COATS OF ALUMINUM PAINT.

MINOR VARIATIONS IN DESIGN MAY BE ACCEPTABLE ON APPROVAL OF THE ENGINEER.

SEAMS OR JOINTS LENGTHWISE OF THE APRON ARE ACCEPTABLE IF SECURELY BOLTED OR WELDED AND PAINTED AS PROVIDED ABOVE.

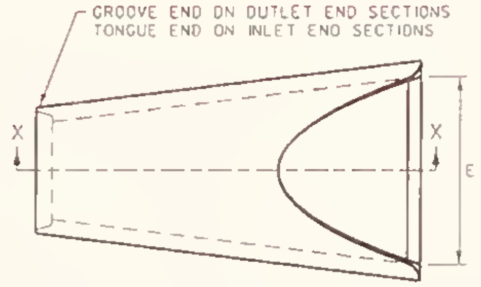
DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 603, 709
DWG. NO.
603-02

CMP FLARED END
TERMINAL SECTION
(FETS)

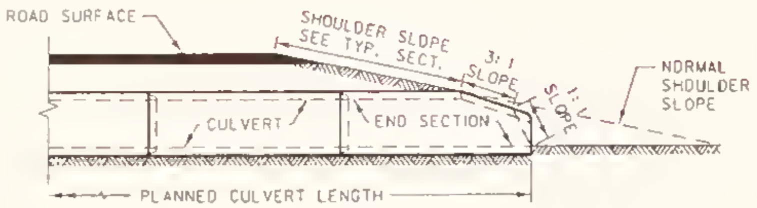
EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

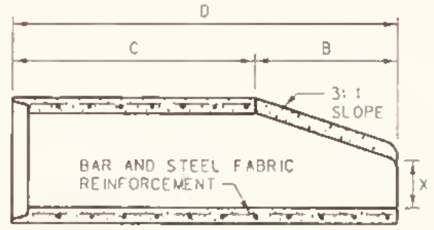
TYPE "A"


GROOVE END ON OUTLET END SECTIONS
TONGUE END ON INLET END SECTIONS
X
X
E

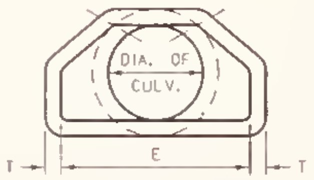
PLAN



SLOPE DETAIL

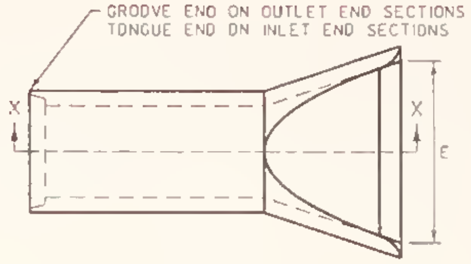


SECTION X-X

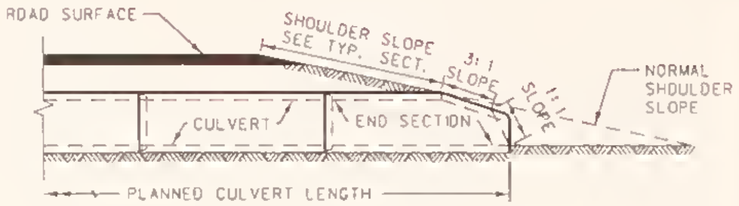


END VIEW

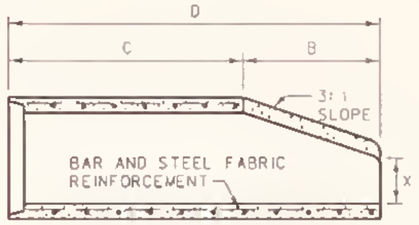
TYPE "B"


GROOVE END ON OUTLET END SECTIONS
TONGUE END ON INLET END SECTIONS
X
X
E

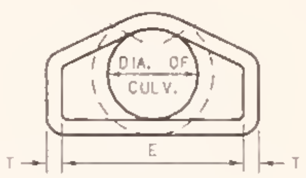
PLAN



SLOPE DETAIL



SECTION X-X



END VIEW

TYPE "A"						
DIA.	X	B	C	D	E	T *
12"	4"	2'-0"	4'-3/8"	6'-3/8"	2'-0"	2"
15"	6"	2'-3"	3'-10"	6'-1"	2'-6"	2 1/4"
18"	9"	2'-3"	3'-10"	6'-1"	3'-0"	2 1/2"
24"	9 1/2"	3'-7 1/2"	2'-6"	6'-1 1/2"	4'-0"	3"
30"	1'-0"	4'-6"	1'-7 3/4"	6'-1 3/4"	5'-0"	3 1/2"
36"	1'-3"	5'-3"	2'-10 3/4"	8'-1 3/4"	6'-0"	4"
42"	1'-9"	5'-3"	2'-11"	8'-2"	6'-6"	4 1/2"
48"	2'-0"	6'-0"	2'-2"	8'-2"	7'-3"	5"
54"	2'-3"	5'-5"	2'-11"	8'-4"	7'-6"	5 1/2"

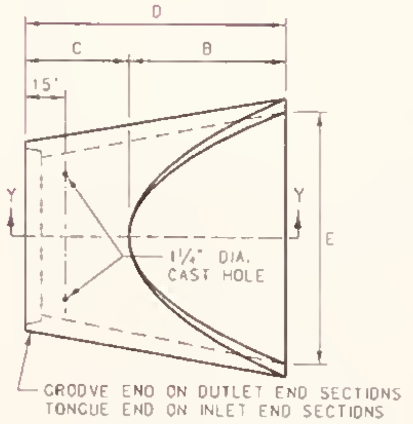
* WALL "B" THICKNESS

TOLERANCES IN THE ADJACENT TABLES MAY NOT VARY MORE THAN ±1.5% FOR THE DIMENSIONS SHOWN, OTHERWISE THEY MUST CONFORM TO AASHTO M 170.

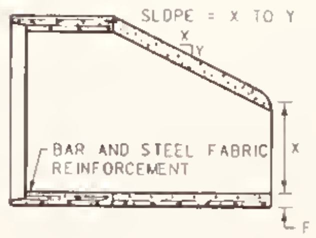
TYPE "B"						
DIA.	X	B	C	D	E	T *
12"	4"	2'-0"	4'-7/8"	6'-7/8"	2'-0"	2"
15"	6"	2'-3"	3'-10"	6'-1"	2'-6"	2 1/4"
18"	9"	2'-3"	3'-10"	6'-1"	3'-0"	2 1/2"
24"	9 1/2"	3'-7 1/2"	2'-6"	6'-1 1/2"	4'-0"	3"
30"	1'-0"	4'-6"	1'-7 3/4"	6'-1 3/4"	5'-0"	3 1/2"
36"	1'-3"	5'-3"	2'-10 3/4"	8'-1 3/4"	6'-0"	4"
42"	1'-9"	5'-3"	2'-11"	8'-2"	6'-6"	4 1/2"
48"	2'-0"	6'-0"	2'-2"	8'-2"	7'-0"	5"
54"	2'-3"	5'-5"	2'-9 1/4"	8'-2 1/4"	7'-6"	5 1/2"

* WALL "B" THICKNESS

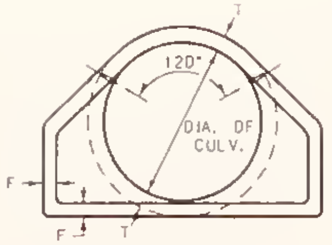
LARGE DIAMETER PIPE


D
C
B
15'
Y
Y
E
1 1/4" DIA. CAST HOLE
GROOVE END ON OUTLET END SECTIONS
TONGUE END ON INLET END SECTIONS

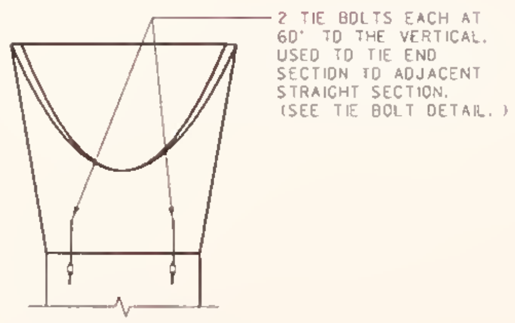
PLAN



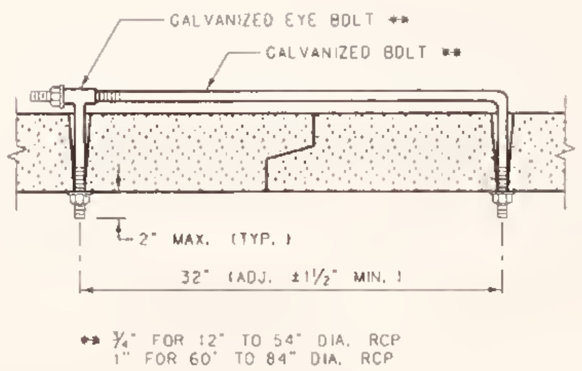
SECTION Y-Y



END VIEW


2 TIE BOLTS EACH AT 60° TO THE VERTICAL. USED TO TIE END SECTION TO ADJACENT STRAIGHT SECTION. (SEE TIE BOLT DETAIL.)

TIE BOLT CONNECTION



TIE BOLT DETAIL

(TWO PER END SECTION)

LARGE DIAMETER CULVERT								
DIA.	SLOPE	T *	X	B	C	D	E	F
60"	2:1	6"	2'-11"	5'-0"	3'-3"	8'-3"	8'-0"	5"
72"	1.86:1	7"	3'-0"	6'-6"	1'-9"	8'-3"	9'-0"	6"
84"	1.5:1	8"	3'-0"	7'-6 1/2"	1'-9"	9'-3 1/2"	10'-0"	6 1/2"

* WALL "B" THICKNESS

TIE BOLTS: USE TWO TIE BOLTS ON ALL FLARED END SECTIONS, ONE ON EACH SIDE AT 60° TO THE VERTICAL. GALVANIZE ALL PARTS. SEE TIE BOLT DETAIL.

CONSTRUCTION: CONSTRUCT ACCORDING TO CLASS III, AASHTO M 170, AS FAR AS DESIGN WILL PERMIT.

DETAILED DRAWING

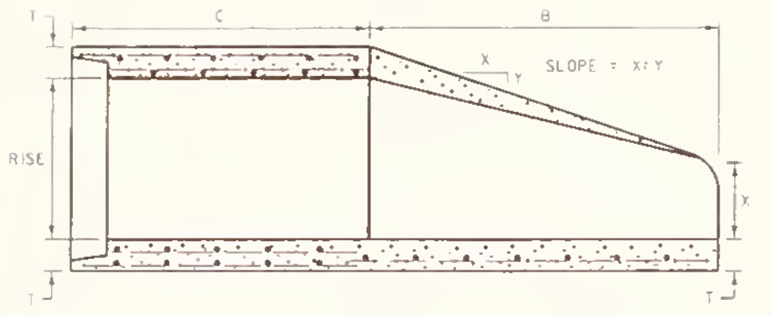
REFERENCE
STANDARD SPEC.
SECTION 603, 708

DWG. NO.
603-08

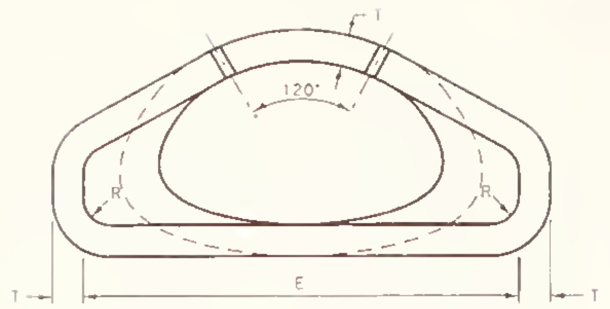
PREFABRICATED RCP
FLARED END TERMINAL
SECTION (FETS)

EFFECTIVE: AUGUST 1999

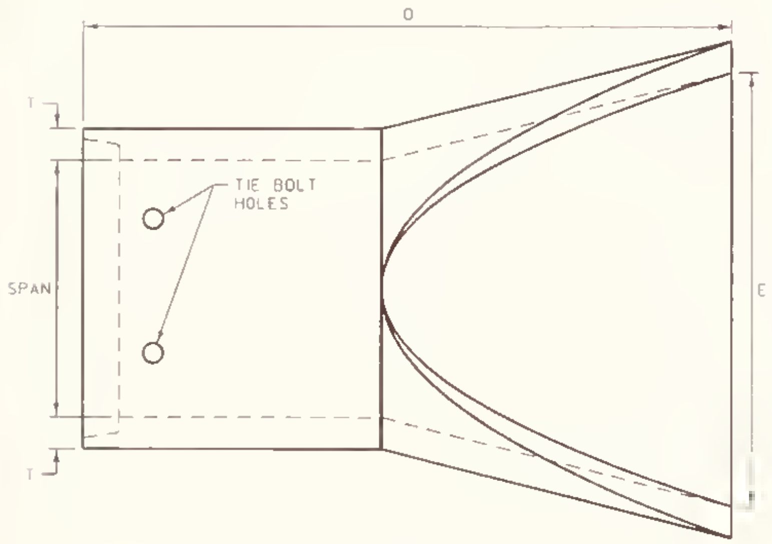
MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



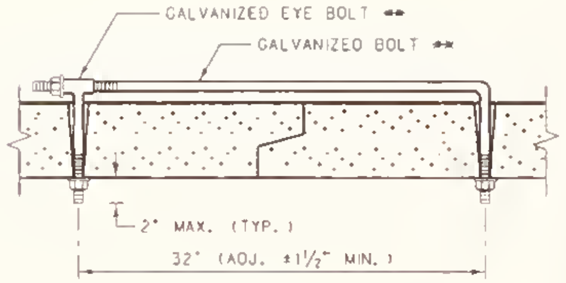
LONGITUDINAL SECTION



END VIEW



PLAN VIEW



** ¾" FOR 18" TO 54" EQUIV. SIZE
1" FOR 60" TO 72" EQUIV. SIZE

TIE BOLT DETAIL
(TWO PER END SECTION)

TIE BOLTS: USE TIE BOLTS ON ALL FLARED END SECTIONS. ONE ON EACH SIDE AT 60° TO THE VERTICAL. GALVANIZE ALL PARTS. SEE TIE BOLT DETAIL.

CONSTRUCTION: CONSTRUCT ACCORDING TO CLASS A-III, AASHTO M 206, AS FAR AS DESIGN WILL PERMIT.

EQUIV. SIZE	SPAN	RISE	T *	X	B	C	D	E	R	SLOPE
18"	22"	13½"	2½"	8½"	45"	27"	72"	36"	3"	3:1
24"	28½"	18"	3"	8½"	39"	33"	72"	48"	3"	3:1
30"	36¼"	22½"	3½"	9½"	50"	46"	96"	60"	3"	3:1
36"	43¾"	26⅝"	4"	11⅛"	60"	36"	96"	72"	6"	3:1
42"	51⅛"	31⁵⁄16"	4½"	15¹³⁄16"	60"	36"	96"	78"	6"	3:1
48"	58½"	36"	5"	21"	60"	36"	96"	84"	6"	3:1
54"	65"	40"	5½"	25½"	60"	36"	96"	90"	6"	3:1
60"	73½"	45"	6"	31"	60"	36"	96"	96"	6"	3:1
72"	88"	54"	7"	31"	60"	39"	99"	120"	6"	2:1

* WALL "B" THICKNESS

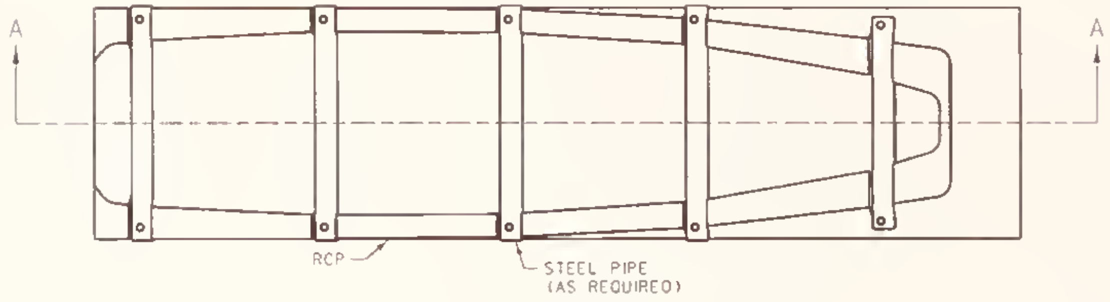
DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 603
DWG. NO.
603-10

PREFABRICATED RCP ARCH
FLARED END TERMINAL
SECTION (FETS)

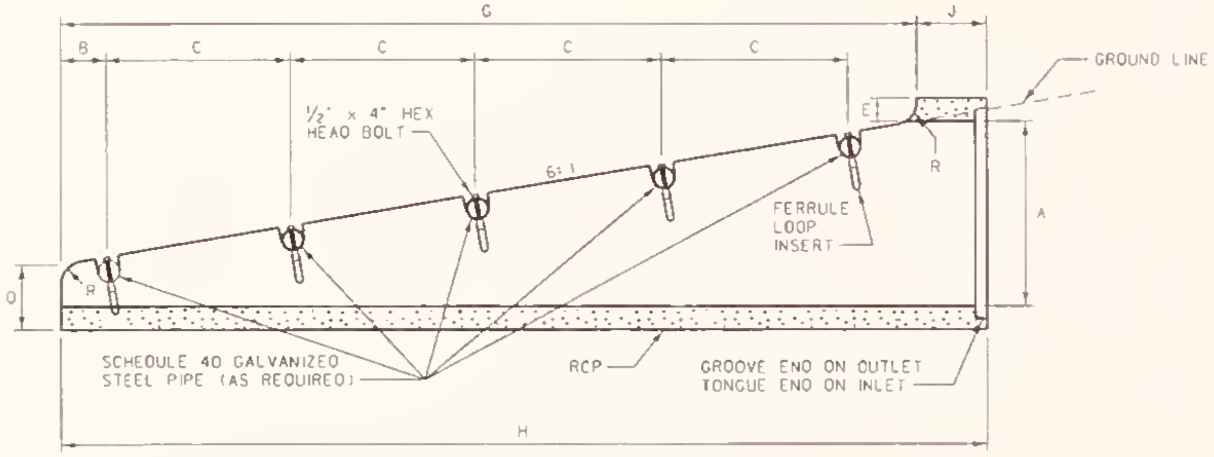
EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

ROAD APPROACH CULVERT END TREATMENT										
QUANTITIES (FOR ESTIMATING ONLY)										
DIA. A RCP	H PIPE LENGTH	F-64½" × 4⅛" FERRULE LOOP INSERT (EACH)	LENGTH 2½" DIA. SCHEDULE 40 GALV. PIPE	DIMENSIONS (FT.)						
				B	C	D	E	G	R	J
15"	4.75'	~	~	~	~	0.69	0.27	4.0	0.25	0.75
18"	6.5'	~	~	~	~	0.71	0.25	5.75	0.25	0.75
24"	10.0'	10	12.5'	0.5	2.0	0.75	0.21	9.25	0.25	0.75

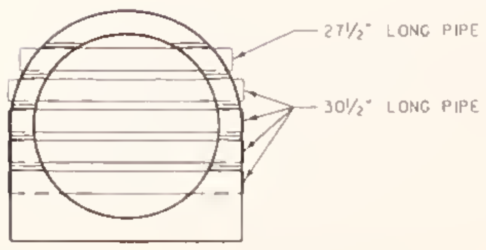


PLAN VIEW

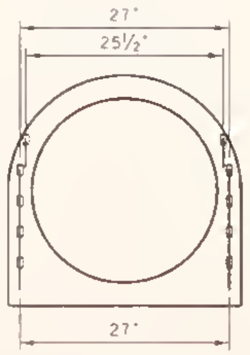


SECTION A-A

NOTE:
PAINT ALL NON-GALVANIZED PARTS IN ACCORDANCE WITH SECTION 710 OF THE STANDARD SPECIFICATIONS.



END VIEW



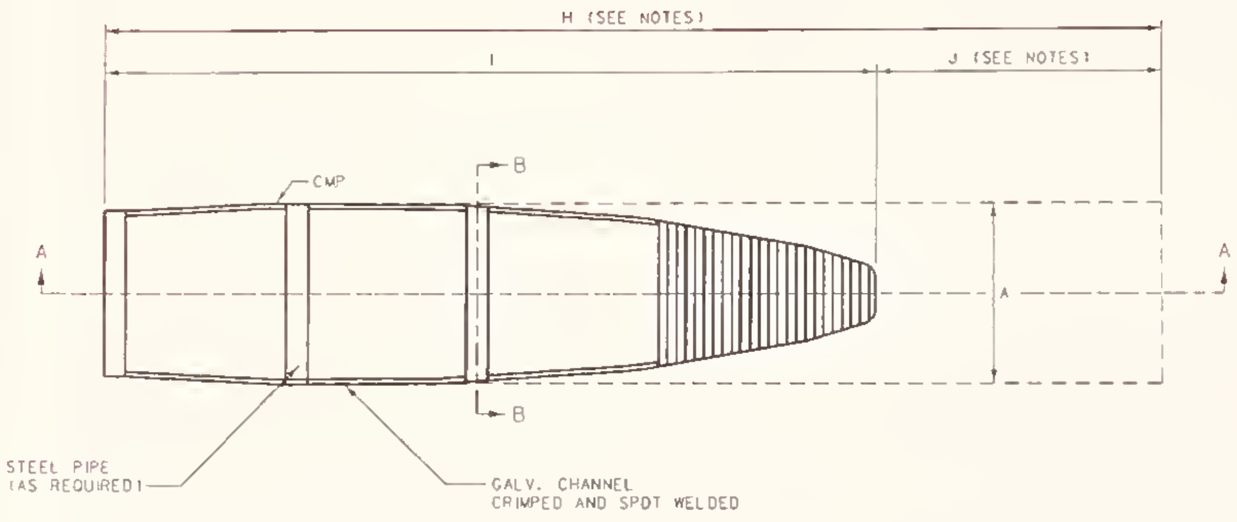
VIEW OF INSERTS

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 603.710
DWG. NO.
603-12

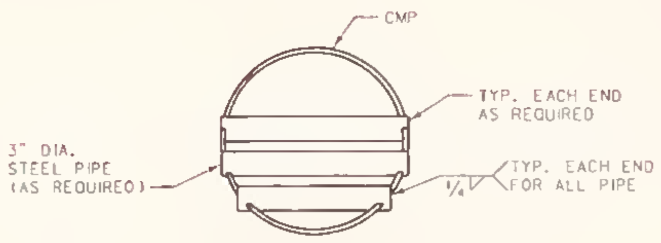
RCP ROAD APPROACH
CULVERT END TREATMENT
(RACET)

EFFECTIVE: AUGUST 1999

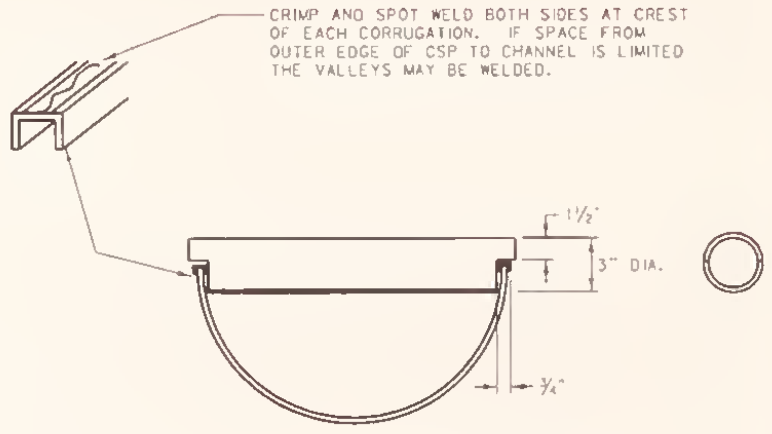
MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



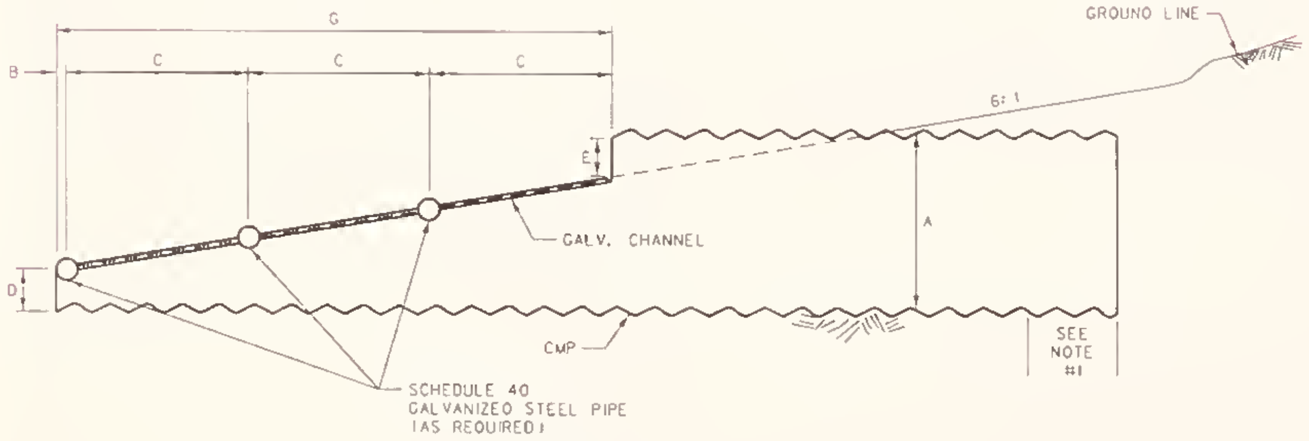
PLAN VIEW


CMP
TYP. EACH END AS REQUIRED
3" DIA. STEEL PIPE (AS REQUIRED)
1/4
TYP. EACH END FOR ALL PIPE

END VIEW


CRIMP AND SPOT WELD BOTH SIDES AT CREST OF EACH CORRUGATION. IF SPACE FROM OUTER EDGE OF CSP TO CHANNEL IS LIMITED THE VALLEYS MAY BE WELDED.
1½"
3" DIA.
¾"

SECTION B-B



SECTION A-A

ILLUSTRATED WITH 24" CMP (30" CMP UTILIZES FOUR GALV. STEEL PIPES)

ROAD APPROACH CULVERT END TREATMENT

QUANTITIES (FOR ESTIMATING ONLY)

DIA. A CMP	H PIPE LENGTH	¾" × ⅜" × ⅛" GALV. CHANNEL	LENGTH 3" DIA SCHEDULE 40 GALV. PIPE	DIMENSIONS (FT.)						
				B	C	D	E	G	I	J
15"	7.0'	10'	~	~	~	0.20	0.20	5.0	6.0	1.0
18"	8.0'	10'	~	~	~	0.33	0.33	5.0	7.0	1.0
24"	10.0'	12'	6.0'	0.15	1.95	0.50	0.50	6.0	9.0	1.0
30"	12.5'	16'	10.0'	0.20	1.95	0.60	0.60	8.0	11.5	1.0

NOTES:

1) PIPE TO HAVE ANNULAR CORRUGATION OR REROLLED ENDS. USE ONLY APPROVED COUPLING BAND PER STANDARD SPECIFICATION 709.02 CMP. FOR RCP END TREATMENT. SEE DTL. DWG. NO. 603-26 FOR CONNECTION.

2) THE TWO ¾" CHANNELS MAY BE ELIMINATED FROM THE CULVERT END TREATMENT IF:

   A. THE CULVERT IS FABRICATED WITH 12 GAGE (0.109" THICK) MATERIAL.

   B. HALF CIRCLE NOTCHES ARE CUT IN THE CULVERT FOR THE STEEL PIPE WITH CONTINUOUS WELD OF THE PERIPHERY IN CONTACT PROVIDED.

   C. ALL WELDS AND OTHER NON-GALVANIZED PARTS ARE PAINTED IN ACCORDANCE WITH STANDARD SPECIFICATIONS SECTION 710.

3) CONNECTIONS MADE PER DTL. DWG. NO. 603-26 REQUIRE PIPE LENGTHS H AND J TO BE INCREASED BY 3".

DETAILED DRAWING

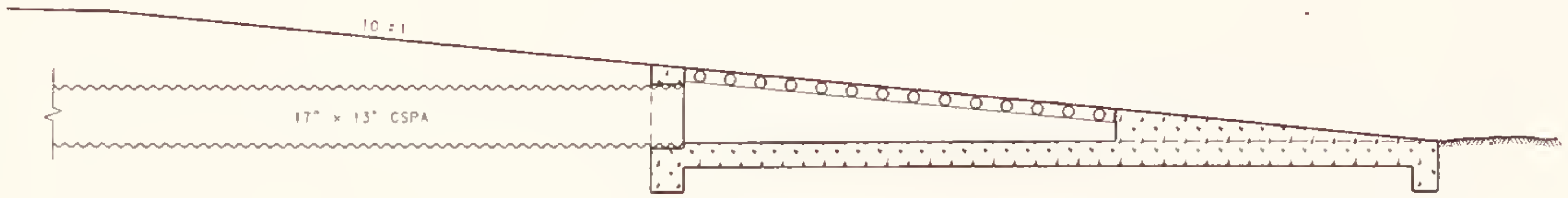
REFERENCE
STANDARD SPEC.
SECTION 603, 709, 710

DWG. NO.
603-14

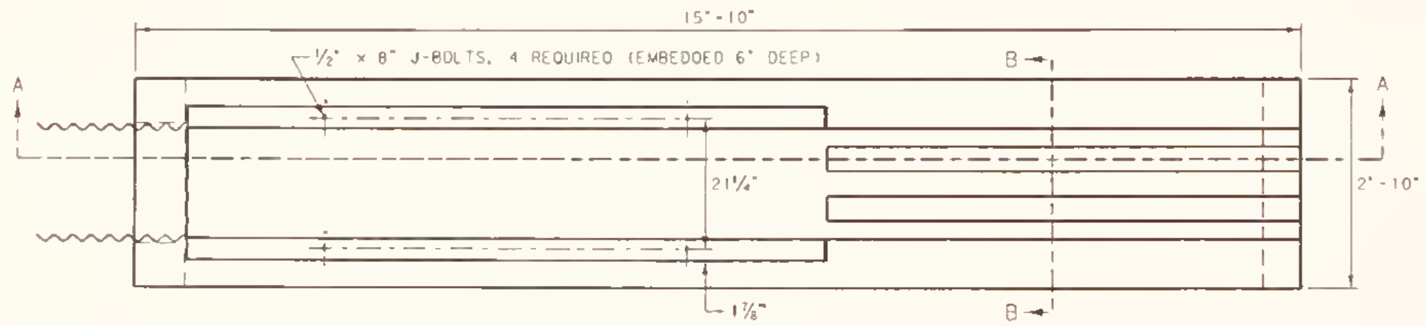
CMP ROAD APPROACH
CULVERT END TREATMENT
(RACET)

EFFECTIVE: AUGUST 1999

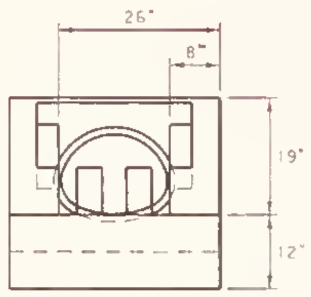
MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



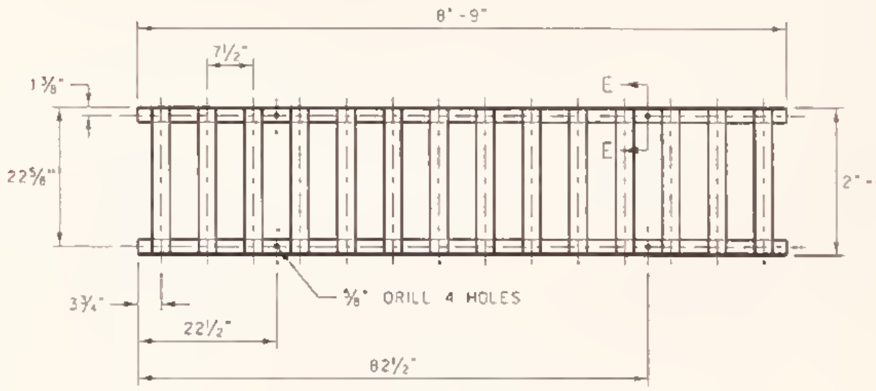
QUANTITIES			
CLASS "DD" CONCRETE (C.Y.)	REINFORCING STEEL (LB.)	STRUCTURAL STEEL (LB.)	½" DIA. × 8" J BOLTS (EACH)
1.5	126	218	4



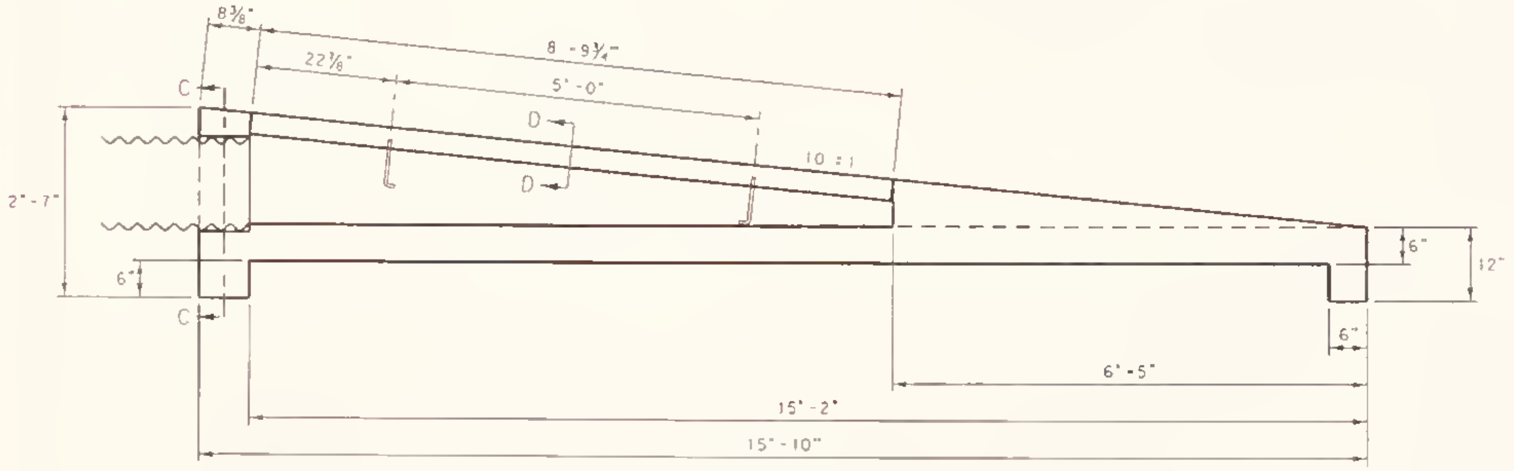
PLAN



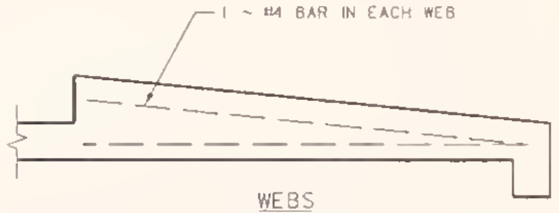
END VIEW



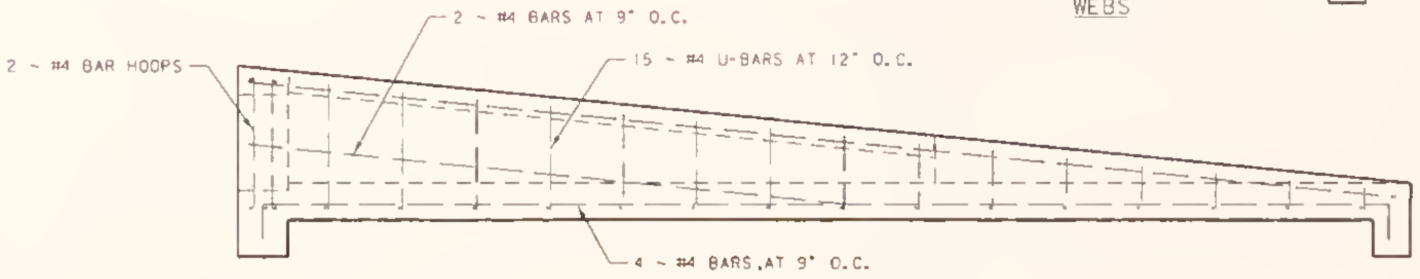
MEDIAN GRATE DETAILS



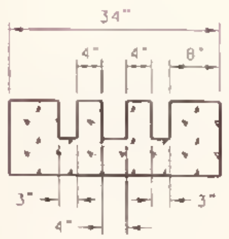
SECTION A-A



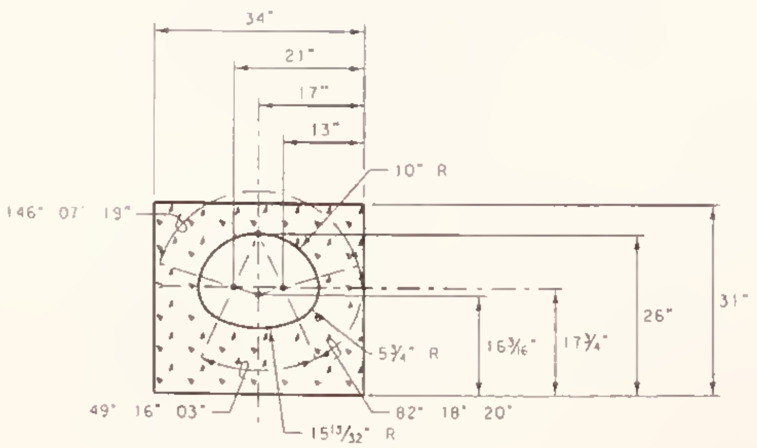
WEBS



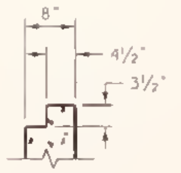
REINFORCING STEEL DETAILS



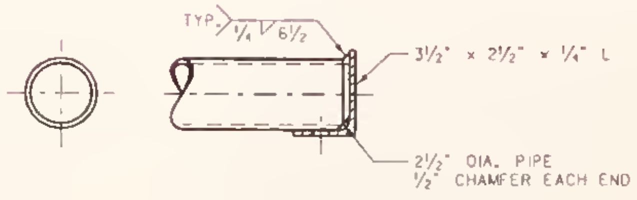
SECTION B-B
WEBS



SECTION C-C
BACKWALL



SECTION D-D
GRATE SLOTS



SECTION E-E

NOTES:

CONFORM ALL STRUCTURAL STEEL FOR GRATES TO THE REQUIREMENTS FOR ASTM A 36 STRUCTURAL CARBON STEEL.

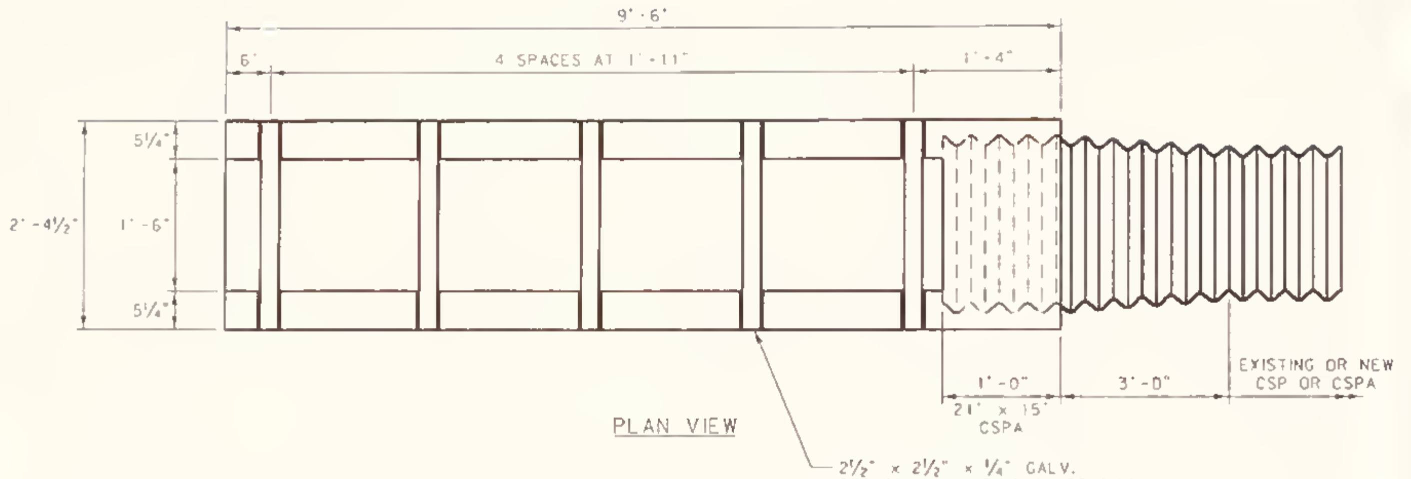
PAINT ALL EXPOSED METAL PARTS AND WELDS WITH ONE COAT OF ZINC RICH PAINT AND TWO COATS OF ALUMINUM PAINT ACCORDING TO STANDARD SPECIFICATION SECTION 710.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 603, 708, 710
DWG. NO.
603-16

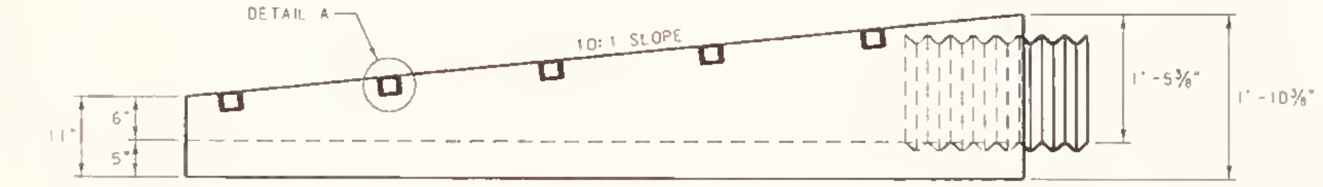
CAST-IN-PLACE MEDIAN
U-TURN CROSS DRAIN
AND CONCRETE BEVELED END

EFFECTIVE: AUGUST 1999

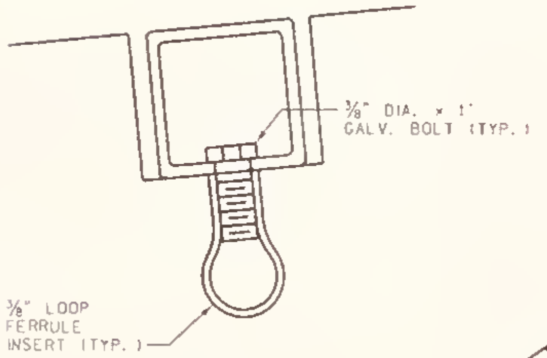
MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD


9'-6"
6"
4 SPACES AT 1'-11"
1'-4"
5¼"
2'-4½"
1'-6"
5¼"
1'-0"
3'-0"
21" x 15" CSPA
EXISTING OR NEW CSP OR CSPA
2½" x 2½" x ¼" GALV. STRUCTURAL TUBING CROSS-PIPE PER ASTM A 500 GRADE B

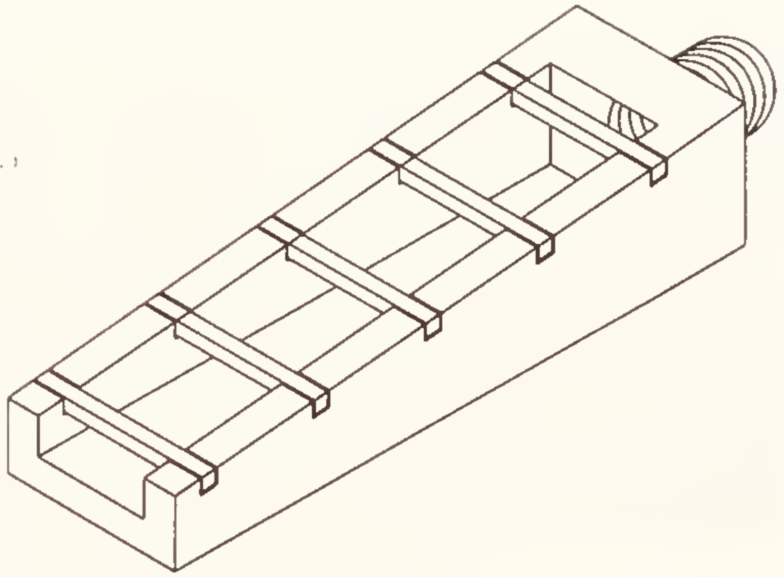
PLAN VIEW



ELEVATION



DETAIL A



NOTE:
PAINT ALL EXPOSED METAL PARTS WITH ONE COAT OF ZINC RICH PAINT AND TWO COATS OF ALUMINUM PAINT ACCORDING TO STANDARD SPECIFICATION SECTION 710.

DETAILED DRAWING

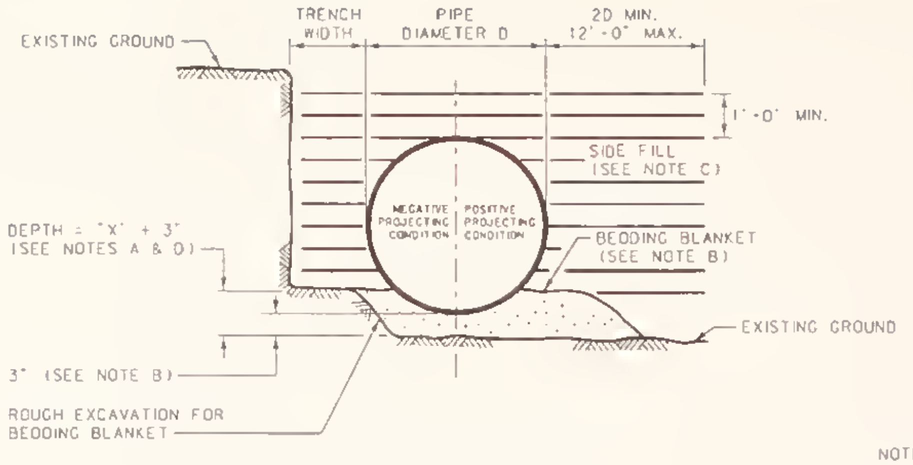
REFERENCE
STANDARD SPEC.
SECTION 603, 708, 710

DWG. NO.
603-17

PRECAST MEDIAN U-TURN
CROSS DRAIN AND CONC.
BEVELED END

EFFECTIVE: AUGUST 1999

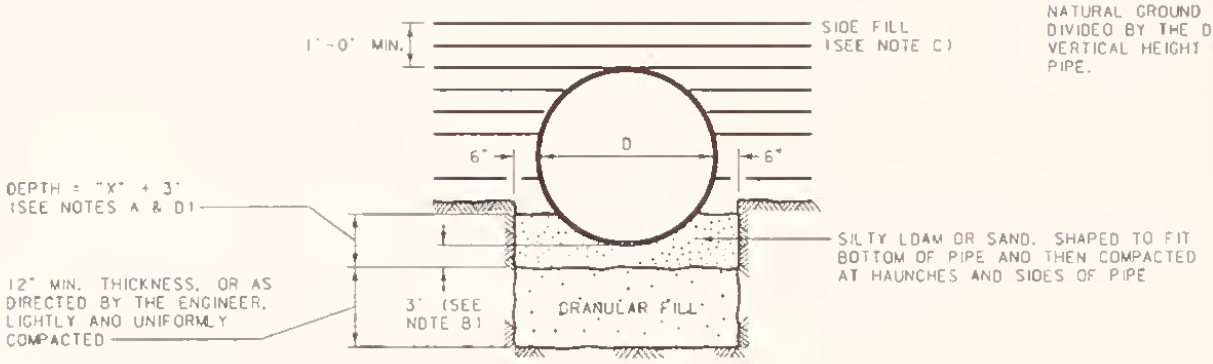
MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD


TRENCH WIDTH
PIPE DIAMETER D
2D MIN. 12'-0" MAX.
EXISTING GROUND
1'-0" MIN.
SIDE FILL (SEE NOTE C)
NEGATIVE PROJECTING CONDITION
POSITIVE PROJECTING CONDITION
DEPTH = "X" + 3" (SEE NOTES A & D)
BEDDING BLANKET (SEE NOTE B)
EXISTING GROUND
3" (SEE NOTE B)
ROUGH EXCAVATION FOR BEDDING BLANKET

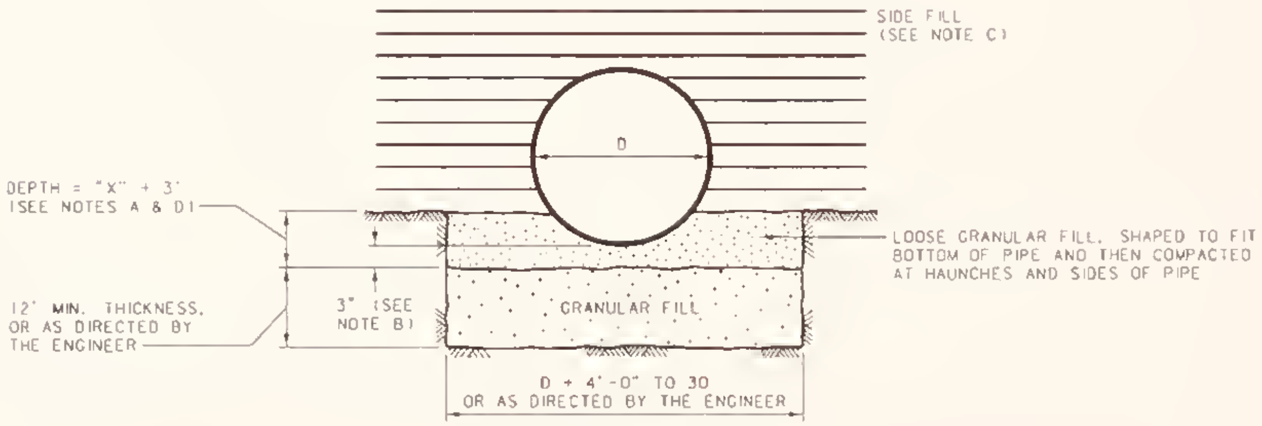
1- PIPE INSTALLATION AND BEDDING

(CLASS C, MODIFIED)

NOTE: THE PROJECTION RATIO FOR POSITIVE EMBANKMENT INSTALLATIONS EQUALS THE VERTICAL DISTANCE BETWEEN THE TOP OF THE PIPE AND THE NATURAL GROUND SURFACE DIVIDED BY THE OUTSIDE VERTICAL HEIGHT OF THE PIPE.


1'-0" MIN.
SIDE FILL (SEE NOTE C)
D
6"
6"
DEPTH = "X" + 3" (SEE NOTES A & D)
SILTY LOAM OR SAND, SHAPED TO FIT BOTTOM OF PIPE AND THEN COMPACTED AT HAUNCHES AND SIDES OF PIPE
12" MIN. THICKNESS, OR AS DIRECTED BY THE ENGINEER, LIGHTLY AND UNIFORMLY COMPACTED
3" (SEE NOTE B)
GRANULAR FILL

2-ROCK


SIDE FILL (SEE NOTE C)
D
DEPTH = "X" + 3" (SEE NOTES A & D)
LOOSE GRANULAR FILL, SHAPED TO FIT BOTTOM OF PIPE AND THEN COMPACTED AT HAUNCHES AND SIDES OF PIPE
12" MIN. THICKNESS, OR AS DIRECTED BY THE ENGINEER
3" (SEE NOTE B)
GRANULAR FILL
D + 4'-0" TO 3D OR AS DIRECTED BY THE ENGINEER

3-FOUNDATION STABILIZATION

NOTES:

(A) FOR STRUCTURAL PLATE PIPE, THE LENGTH OF BEDDING ARC NEED NOT EXCEED WIDTH OF BOTTOM PLATE.

(B) SHAPE BEDDING BLANKET OF SILTY LOAM OR SAND TO FIT BOTTOM OF PIPE. THE MINIMUM THICKNESS BEFORE PLACING PIPE IS 3".

(C) COMPACT SIDE FILL IN 6" LAYERS TO DENSITY SPECIFIED FOR ADJACENT EMBANKMENT. SEE SECTION 203.03.3 OF THE STANDARD SPECIFICATIONS FOR THE DENSITY REQUIREMENTS.

(D) SEE DTL. DWG. NO. 603-08 AND 603-32 FOR "X" DIMENSIONS ON CONCRETE CULVERTS AND DTL. DWG. NO. 603-10 AND 603-34 FOR "X" DIMENSIONS ON METAL CULVERTS.

DETAILED DRAWING

REFERENCE
STANDARD SPEC.
SECTION 207, 603, 701

DWG. NO.
603-18

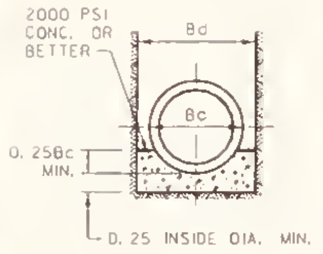
CSP AND SSPP
CULVERT BEDDING

EFFECTIVE: AUGUST 1999

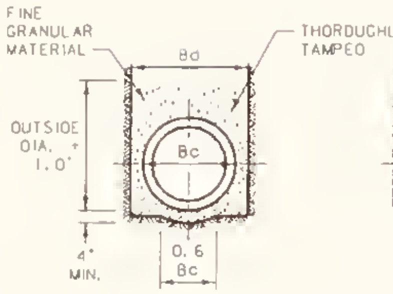
MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

TYPES OF TRENCH BEDDING

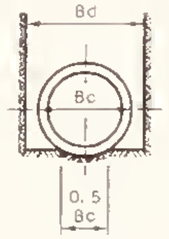
NOTE: THE PROJECTION RATIO (P) FOR POSITIVE EMBANKMENT INSTALLATIONS EQUALS THE VERTICAL DISTANCE BETWEEN THE TOP OF THE PIPE AND THE NATURAL GROUND SURFACE DIVIDED BY THE OUTSIDE VERTICAL HEIGHT OF THE PIPE.



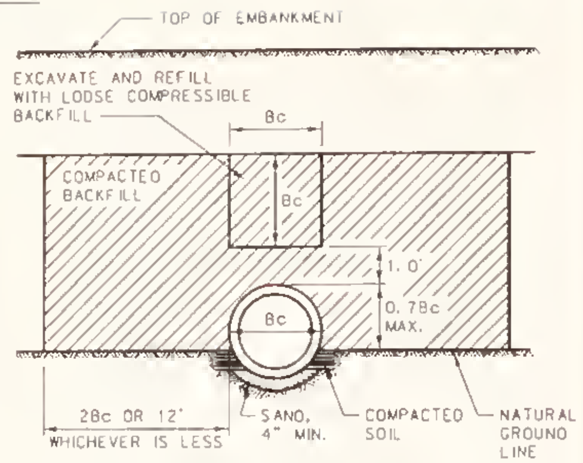
CLASS A
LOAD FACTOR = 3.0



CLASS B
LOAD FACTOR = 1.9

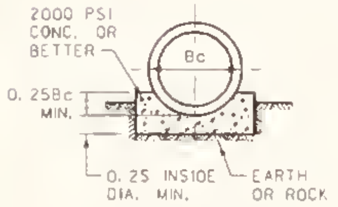


CLASS C
LOAD FACTOR : 1.5

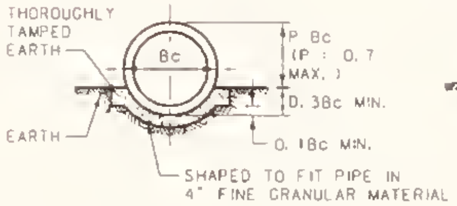


CLASS B-1

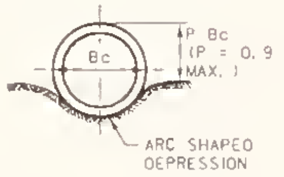
TYPES OF EMBANKMENT BEDDING

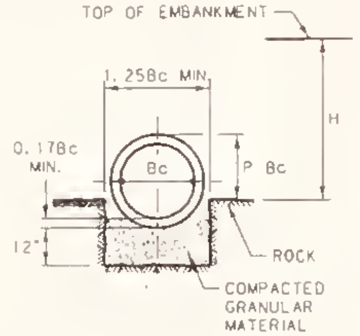


CLASS A



CLASS B





CLASS C

DESCRIPTION OF BEDDING CLASSES

CLASS A CONCRETE CRADLE BEDDING

THE LOWER PART OF THE PIPE EXTERIOR IS BEDDED IN A CONTINUOUS CRADLE CONSTRUCTED OF 2000 PSI CONCRETE OR BETTER, HAVING A MINIMUM THICKNESS UNDER THE PIPE OF ONE-FOURTH THE NOMINAL INSIDE DIAMETER AND EXTENDING UP THE SIDES OF THE PIPE FOR A HEIGHT EQUAL TO ONE-FOURTH OF THE OUTSIDE DIAMETER. THE CRADLE HAS A MINIMUM WIDTH EQUAL TO THE OUTSIDE DIAMETER OF THE PIPE PLUS 8", AND IS CONSTRUCTED MONOLITHICALLY WITHOUT HORIZONTAL CONSTRUCTION JOINTS.

CLASS B BEDDING

(1) THIS CLASS OF BEDDING FOR EMBANKMENT CONDITIONS IS APPLICABLE ONLY WHEN THE PROJECTION RATIO IS 0.7 AND LESS. THE PIPE IS BEDDED CAREFULLY ON FINE GRANULAR MATERIALS OVER AN EARTH FOUNDATION, ACCURATELY SHAPED BY MEANS OF A TEMPLATE TO FIT THE LOWER PART OF THE PIPE EXTERIOR FOR AT LEAST 10% OF THE CULVERT OVERALL HEIGHT. THEN COMPACTABLE SOIL MATERIAL IS RAMMED AND TAMPED IN LAYERS NOT MORE THAN 6" THICK AROUND THE PIPE FOR THE REMAINDER OF THE LOWER 20% OF ITS HEIGHT. BACKFILLING IS COMPLETED TO THE TOP OF THE PIPE, CONFORMING WITH THE APPLICABLE PROVISIONS OF THE STANDARD SPECIFICATIONS.

(2) FOR TRENCH CONDITIONS, THE CULVERT IS PLACED AS DESCRIBED IN B(1) EXCEPT THAT THE EARTH FOUNDATION IS SHAPED TO FIT THE LOWER PART OF THE CULVERT EXTERIOR FOR A WIDTH OF AT LEAST 60% OF THE CULVERT BREADTH. THEN THE REMAINDER OF THE CULVERT IS ENTIRELY SURROUNDED TO A HEIGHT OF AT LEAST 12" ABOVE ITS TOP WITH GRANULAR MATERIAL PLACED BY HAND TO FILL ALL SPACES UNDER AND ADJACENT TO THE CULVERT. THE FILL IS TAMPED THOROUGHLY ON EACH SIDE AND UNDER THE CULVERT AS FAR AS PRACTICAL IN LAYERS NOT TO EXCEED 6" IN THICKNESS.

CLASS B-1 BEDDING

IN THIS TYPE OF INSTALLATION, SOMETIMES CALLED THE IMPERFECT TRENCH METHOD, THE PIPE CULVERT IS FIRST INSTALLED IN ACCORDANCE WITH THE REQUIREMENTS OF B(2). THEN THE FILL IS COMPACTED AT EACH SIDE OF THE PIPE FOR A LATERAL DISTANCE EQUAL TO TWICE THE OUTSIDE DIAMETER OR 12 FEET, WHICHEVER IS LESS, AND CARRIED UP TO AN ELEVATION ABOVE THE TOP OF THE PIPE EQUAL TO THE OUTSIDE DIAMETER OF THE PIPE PLUS 12". NEXT A TRENCH IS DUG EQUAL IN WIDTH TO THE OUTSIDE DIAMETER OF THE PIPE IN THE FILL DIRECTLY OVER THE CULVERT, DOWN TO AN ELEVATION 12" ABOVE THE TOP OF THE PIPE. CARE IS EXERCISED TO KEEP THE SIDES AS VERTICAL AS POSSIBLE. AFTER THE TRENCH IS EXCAVATED, IT IS REFILLLED WITH LOOSE, HIGHLY COMPRESSIBLE SOIL MATERIAL. STRAW, HAY, LEAVES, BRUSH OR SAWDUST MAY BE USED TO FILL THE LOWER ONE-FOURTH TO ONE-THIRD OF THE TRENCH IN ORDER TO INSURE HIGH COMPRESSIBILITY OF THE BACKFILL. THIS BACKFILL OF STRAW, HAY, ETC. MAY NOT BE CARRIED CLOSER THAN 10 FEET TO THE OUTSIDE SLOPE OF THE FILL; THE OUTSIDE 10 FEET IS COMPOSED OF IMPERVIOUS MATERIAL, THOROUGHLY COMPACTED. AFTER THE BACKFILL IS COMPLETED, THE BALANCE OF THE FILL IS CONSTRUCTED BY NORMAL METHODS UP TO THE FINISHED GRADE OF EMBANKMENT.

CLASS C BEDDING

FOR PROJECTING EMBANKMENT CULVERTS, THIS METHOD OF BEDDING IS WITH "ORDINARY" CARE IN AN EARTH FOUNDATION SHAPED IN THE FORM OF AN ARC TO FIT THE LOWER PART OF THE CULVERT EXTERIOR WITH REASONABLE CLOSENESS FOR AT LEAST 10% OF ITS OVERALL HEIGHT. THE REMAINDER OF PIPE IS SURROUNDED BY MATERIAL PLACED BY HAND TOOLS TO COMPLETELY FILL ALL SPACES UNDER AND ADJACENT TO THE PIPE. THEN BACKFILLING IS COMPLETED TO THE TOP AS SPECIFIED IN THE STANDARD SPECIFICATIONS. IF THE CULVERT IS PLACED ON ROCK FOUNDATIONS, PROJECTING EMBANKMENT CULVERT PIPES ARE BEDDED ON AN EARTH CUSHION HAVING A MINIMUM ALLOWABLE THICKNESS OF 12" ± WITH THE EARTH FOUNDATION CAREFULLY SHAPED AND FILLED AROUND THE CULVERT THE SAME AS ORDINARY PROJECTING EMBANKMENT BEDDING ON AN EARTH FOUNDATION.

CLASS C-1 BEDDING

THE PIPE IS INSTALLED IN ACCORDANCE WITH CLASS C BEDDING, USING THE IMPERFECT TRENCH METHOD AS DESCRIBED UNDER CLASS B-1 BEDDING.

WHEN NATURAL GROUND MATERIAL SIMULATES BEDDING MATERIAL, NO SPECIAL BEDDING MATERIAL NEED BE USED. CLASS C BEDDING IS USED UNLESS OTHERWISE NOTED ON THE PLANS.

COMPACTION

ALL FOUNDATIONS REQUIRE COMPACTION.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 207, 603, 701
DWG. NO.
603-20

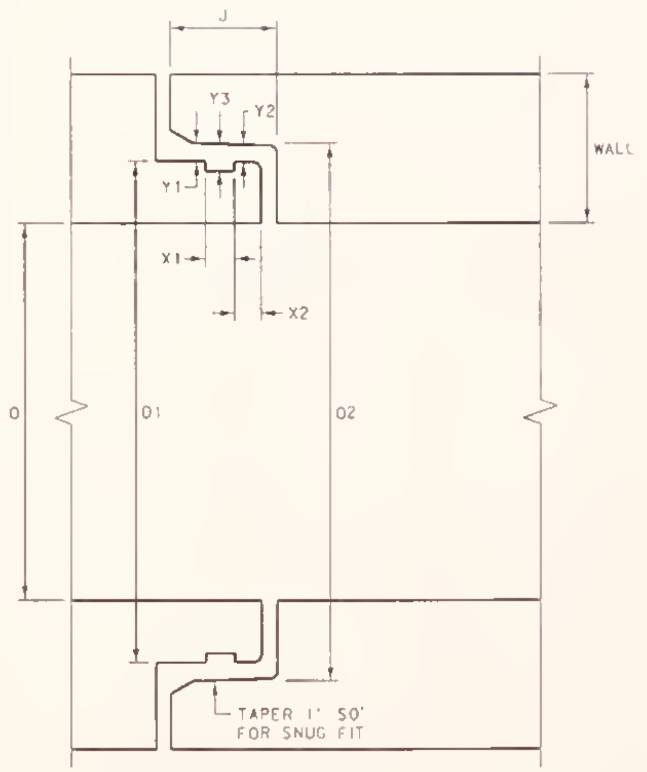
RCP
CULVERT BEDDING

EFFECTIVE: AUGUST 1999

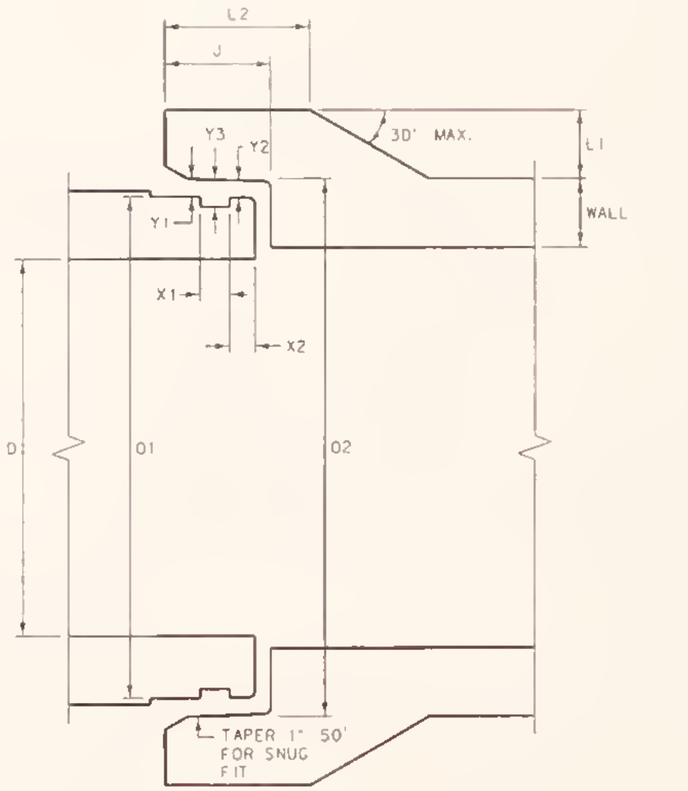
MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

DIA. D	APPROX. DIA. GASKET MATL. NOT STRETCHED	LENGTH OF JOINT J	D1	D2	L2 (MIN.)	L1 (WALL "B")	L1 (WALL "C")	X1	X2	Y1	Y2	Y3
12"	21/32"	3 5/8"	15.223"	15.331"	5"	2"	~	1"	7/8"	0.062"	0.090"	0.313"
15"	21/32"	3 5/8"	18.723"	18.831"	4 3/4"	2 3/16"	~	1"	7/8"	0.062"	0.090"	0.313"
18"	21/32"	3 5/8"	22.098"	22.206"	5"	2 3/8"	~	1"	7/8"	0.062"	0.090"	0.313"
21"	21/32"	3 7/8"	25.600"	25.724"	5 1/4"	2 9/16"	~	1"	7/8"	0.062"	0.090"	0.313"
24"	21/32"	3 7/8"	28.975"	29.099"	5 1/2"	2 3/4"	2"	1"	7/8"	0.062"	0.090"	0.313"
27"	21/32"	4"	32.476"	32.608"	5 1/2"	2 3/4"	2"	1"	7/8"	0.062"	0.090"	0.313"
30"	21/32"	4"	35.976"	36.108"	5 1/2"	2 3/4"	2"	1"	7/8"	0.062"	0.090"	0.313"
33"	21/32"	4 1/8"	39.476"	39.616"	5 3/4"	2 7/8"	2 1/8"	1"	7/8"	0.062"	0.090"	0.313"
36"	21/32"	4 1/8"	42.976"	43.116"	6"	3 1/8"	2 3/8"	1"	7/8"	0.062"	0.090"	0.313"
42"	3/4"	4 5/8"	50.183"	50.183"	6 3/4"	3 3/4"	3"	1 3/16"	1"	0.067"	0.129"	0.376"
48"	3/4"	4 3/4"	57.023"	57.193"	7 1/4"	4 1/8"	3 3/8"	1 3/16"	1"	0.067"	0.129"	0.376"
54"	3/4"	5"	63.007"	63.192"	7 1/2"	3 5/8"	2 7/8"	1 3/16"	1"	0.067"	0.129"	0.376"
60"	3/4"	5"	69.007"	69.192"	7 1/2"	3 1/8"	2 3/8"	1 3/16"	1"	0.067"	0.129"	0.376"
66"	13/16"	5"	75.007"	75.192"	7 1/2"	2 3/4"	2"	1 3/16"	1"	0.067"	0.129"	0.376"
72"	13/16"	5 1/4"	79.250"	79.400"	~	~	~	1 3/16"	1 1/4"	0.093"	0.190"	0.376"
78"	13/16"	5 1/4"	86.250"	86.400"	~	~	~	1 3/16"	1 1/4"	0.093"	0.190"	0.376"
84"	13/16"	5 1/4"	91.500"	91.650"	~	~	~	1 3/16"	1 1/4"	0.093"	0.190"	0.376"
90"	13/16"	5 1/4"	97.750"	97.900"	~	~	~	1 3/16"	1 1/4"	0.093"	0.190"	0.376"
96"	13/16"	5 1/4"	104.250"	104.400"	~	~	~	1 3/16"	1 1/4"	0.093"	0.190"	0.376"
102"	13/16"	5 1/4"	110.750"	110.900"	~	~	~	1 3/16"	1 1/4"	0.093"	0.190"	0.376"
108"	13/16"	5 1/4"	117.250"	117.400"	~	~	~	1 3/16"	1 1/4"	0.093"	0.190"	0.376"

72" DIA. PIPES AND LARGER



66" DIA. PIPES AND SMALLER



NOTES:

TYPICAL FOR STORM DRAIN AND IRRIGATION APPLICATIONS (FOR HEADS UP TO 20 FEET).

USE RUBBER GASKETS THAT MEET THE REQUIREMENTS OF STANDARD SPECIFICATION 707.02.1.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 603, 707, 708
DWG. NO.
603-22

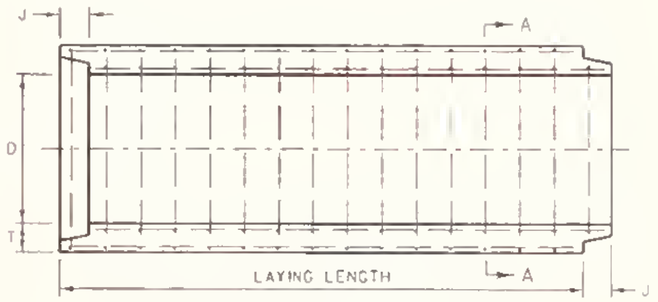
WATER TIGHT JOINT FOR
REINFORCED CONCRETE PIPE

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

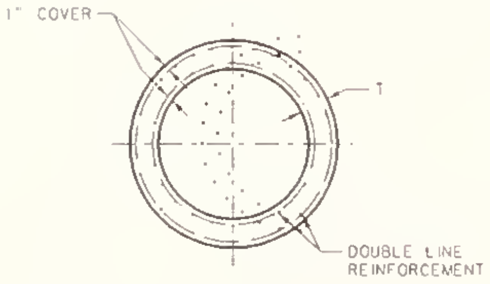
DIA. D	XSEC. WATER AREA (SQ. FT.)	WT. PER L.F. OF PIPE (LB.)	T * MIN. WALL THICKNESS	J LENGTH OF JOINT	A (NOMINAL) = (D2 - D1)/2	D1	D2	D3	D4
12"	0.79	92	2"	1 3/4"	3/16"	13 1/4"	13 5/8"	13 7/8"	14 1/4"
15"	1.23	127	2 1/4"	2"	3/16"	16 1/2"	16 7/8"	17 1/4"	17 5/8"
18"	1.77	168	2 1/2"	2 1/4"	3/16"	19 5/8"	20"	20 3/8"	20 3/4"
21"	2.40	214	2 3/4"	2 1/2"	3/16"	22 7/8"	23 1/4"	23 3/4"	24 1/8"
24"	3.14	265	3"	2 3/4"	3/16"	26"	26 3/8"	27"	27 3/8"
27"	3.98	322	3 1/4"	3"	3/16"	29 1/4"	29 5/8"	30 1/4"	30 5/8"
30"	4.91	384	3 1/2"	3 1/4"	3/16"	32 3/8"	32 3/4"	33 1/2"	33 7/8"
33"	5.94	452	3 3/4"	3 1/2"	1/4"	35 1/2"	36"	36 3/4"	37 1/4"
36"	7.07	524	4"	3 3/4"	1/4"	38 3/4"	39 1/4"	40"	40 1/2"
42"	9.62	685	4 1/2"	4"	1/4"	45 1/8"	45 3/8"	46 1/2"	47"
48"	12.57	867	5"	4 1/4"	1/4"	51 1/2"	52"	53"	53 1/2"
54"	15.90	1070	5 1/2"	4 1/2"	1/4"	57 7/8"	58 3/8"	59 3/8"	59 7/8"
60"	19.63	1296	6"	5"	1/4"	64 1/4"	64 3/4"	66"	66 1/2"
66"	23.76	1542	6 1/2"	5 1/2"	1/4"	70 5/8"	71 1/8"	72 1/2"	73"
72"	28.27	1810	7"	6"	1/4"	77"	77 1/2"	79"	79 1/2"
78"	33.18	2098	7 1/2"	6 1/2"	1/4"	83 3/8"	83 7/8"	85 5/8"	86 1/3"
84"	38.48	2410	8"	7"	1/4"	89 3/4"	90 1/4"	92 1/8"	92 5/8"
90"	44.18	2740	8 1/2"	7"	1/4"	95 3/4"	96 1/4"	98 1/8"	98 5/8"
96"	50.27	2950	9"	7"	1/4"	102 1/8"	102 5/8"	104 1/2"	105"
102"	56.75	3075	9 1/2"	7 1/2"	1/4"	109"	109 1/2"	111 1/2"	112"
108"	63.62	3870	10"	7 1/2"	1/4"	115 1/2"	116"	118"	118 1/2"

* WALL "B" THICKNESS

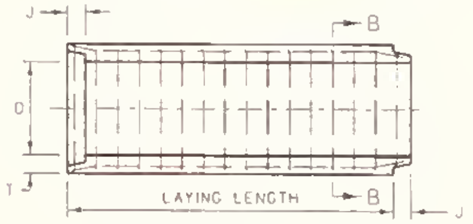


TYPICAL LONGITUDINAL SECTION

36" DIAMETER PIPES AND LARGER

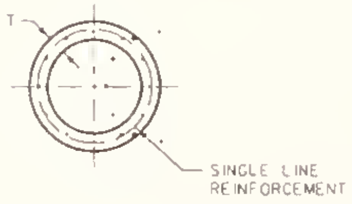


SECTION A-A

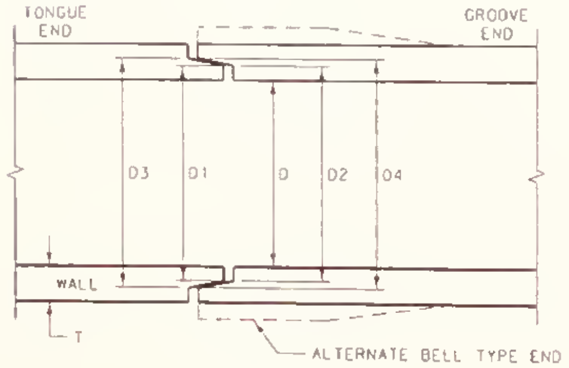


TYPICAL LONGITUDINAL SECTION

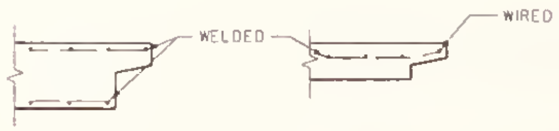
33" DIAMETER PIPES AND SMALLER



SECTION B-B



JOINT DETAIL



REINFORCING AT ENDS OF PIPE

NOTES:

TOLERANCES IN DIMENSIONS IN ACCORDANCE WITH AASHTO M 170.

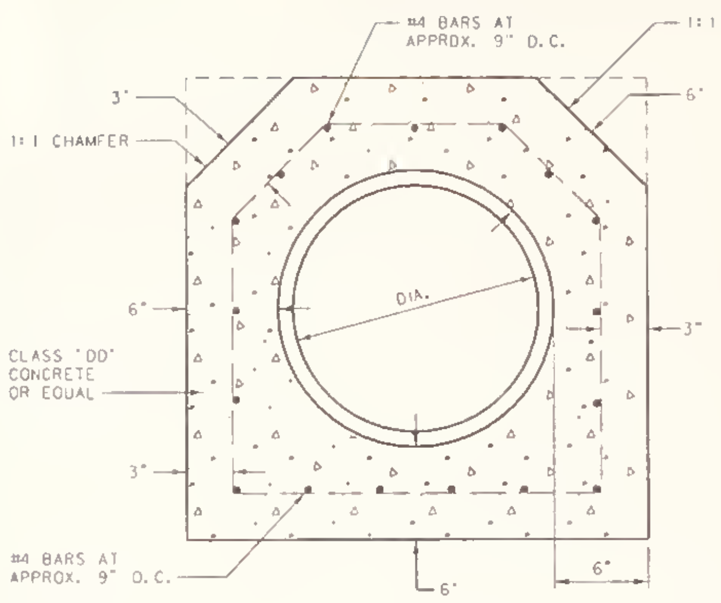
TYPICAL FOR DRAINAGE APPLICATIONS.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 603.708
DWG. NO.
603-24

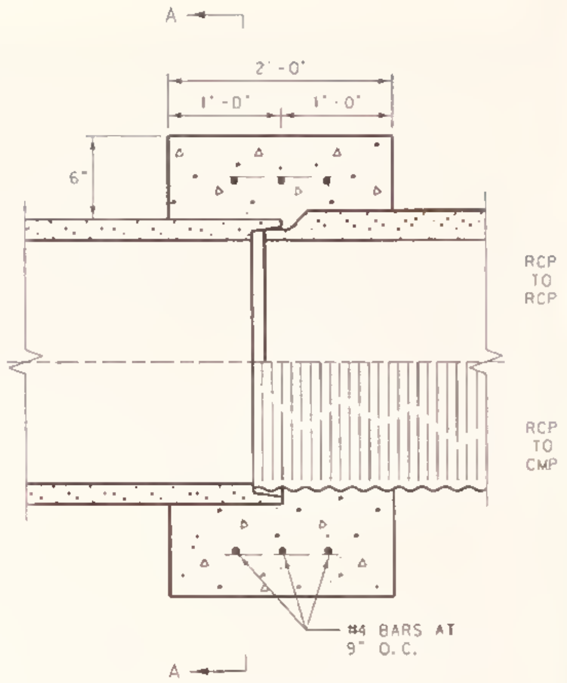
REINFORCED CONCRETE
PIPE JOINT

EFFECTIVE: AUGUST 1999

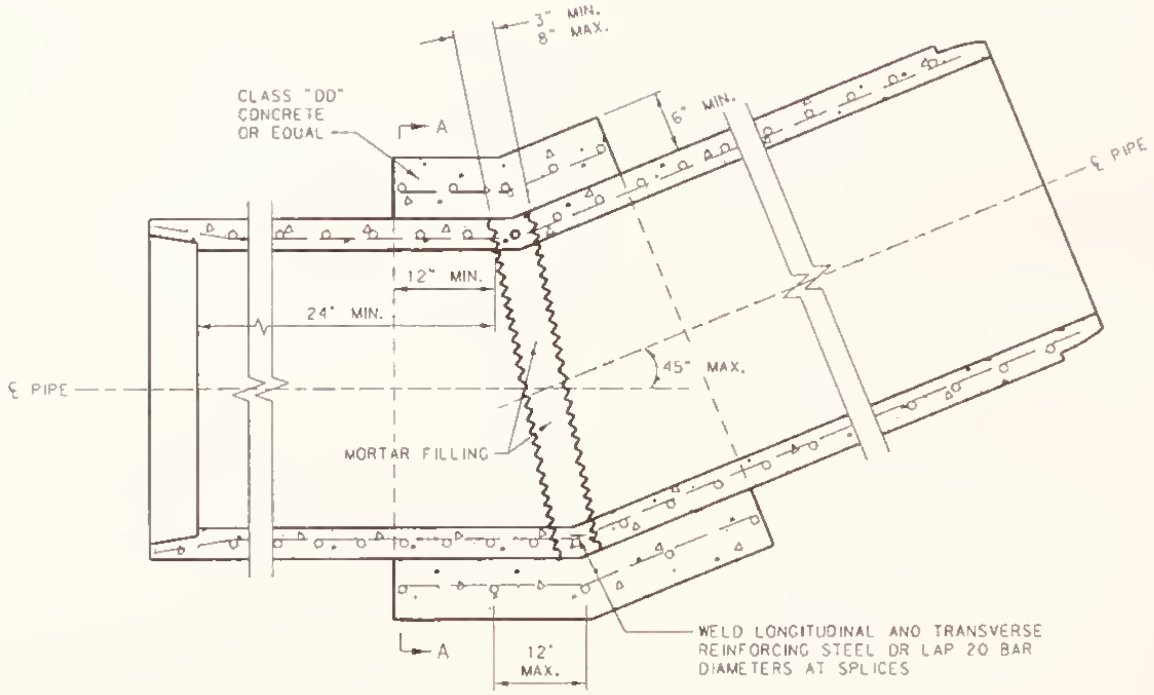
MONTANA DEPARTMENT
OF TRANSPORTATION
MONTANA
CADD



SECTION A-A



CONNECTION DETAILS



TYPICAL FIELD CAST CONCRETE BEND

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 603.708
DWG. NO.
603-26

TYPICAL FIELD CAST
CONCRETE CONNECTIONS

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT
OF TRANSPORTATION
MONTANA
CADD

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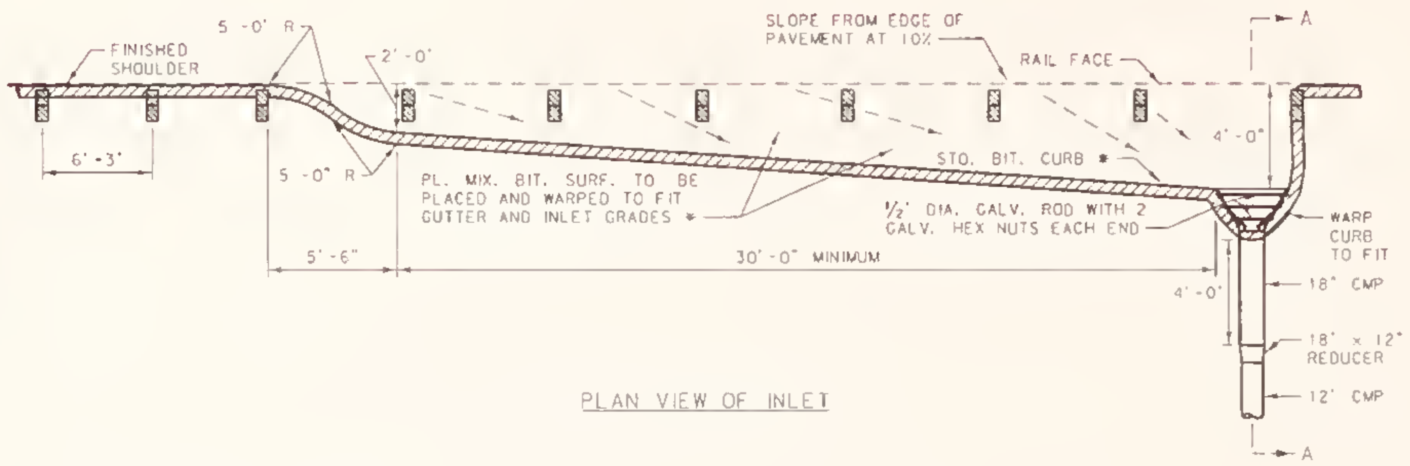
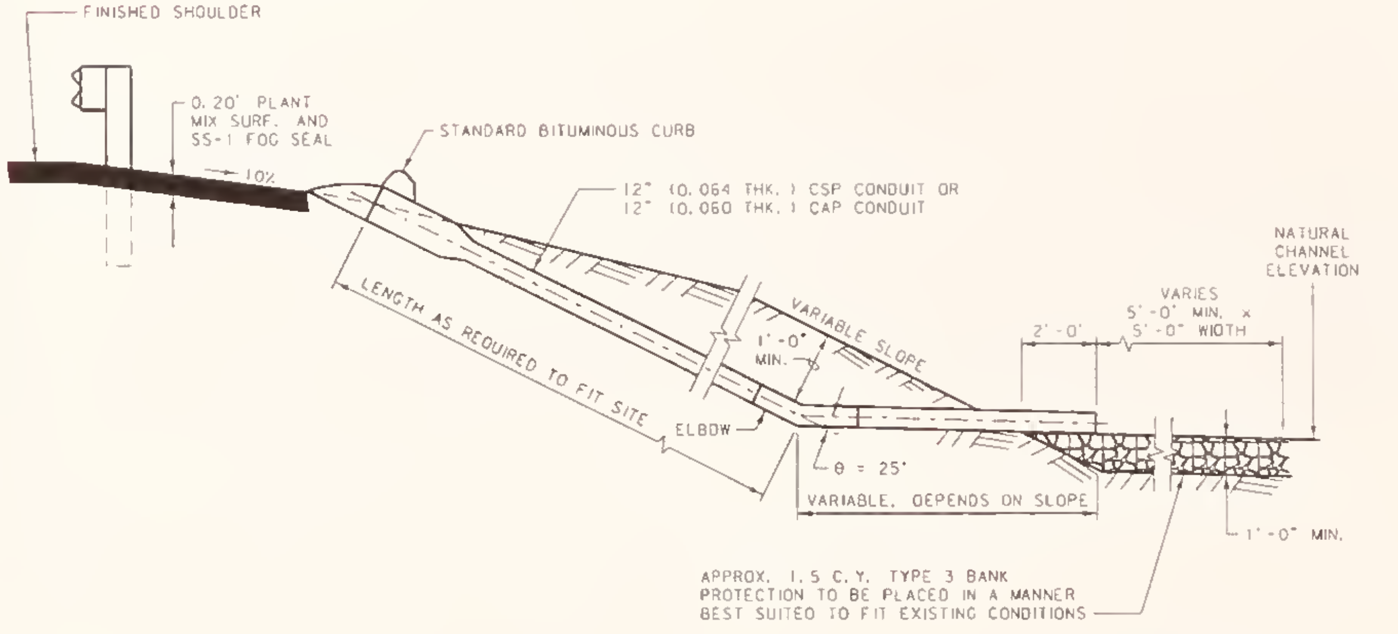
NOTE: DASHED ARROWS DENOTE DIRECTION OF WATER FLOW.


5 -0' R
FINISHED SHOULDER
2' -0'
SLOPE FROM EDGE OF PAVEMENT AT 10%
RAIL FACE
A
6' -3'
5 -0" R
PL. MIX. BIT. SURF. TO BE PLACED AND WARPED TO FIT GUTTER AND INLET GRADES *
STD. BIT. CURB *
4' -0"
½" DIA. GALV. ROD WITH 2 GALV. HEX NUTS EACH END
WARP CURB TO FIT
5' -6"
30' -0" MINIMUM
4' -0'
18" CMP
18" × 12" REDUCER
12" CMP
A

PLAN VIEW OF INLET


FINISHED SHOULDER
0.20' PLANT MIX SURF. AND SS-1 FOG SEAL
10%
STANDARD BITUMINOUS CURB
12" (0.064 THK.) CSP CONDUIT OR
12" (0.060 THK.) CAP CONDUIT
NATURAL CHANNEL ELEVATION
VARIES 5' -0' MIN. × 5' -0" WIDTH
2' -0'
LENGTH AS REQUIRED TO FIT SITE
1' -0" MIN.
VARIABLE SLOPE
ELBOW
θ = 25°
VARIABLE, DEPENDS ON SLOPE
1' -0" MIN.
APPROX. 1.5 C.Y. TYPE 3 BANK PROTECTION TO BE PLACED IN A MANNER BEST SUITED TO FIT EXISTING CONDITIONS

OUTLET DETAIL

SECTION A-A

NOTES:

CORRUGATION MAY BE EITHER ANNULAR OR HELICAL. BEND ON ELBOW (θ) IS AS SHOWN UNLESS OTHERWISE SPECIFIED IN THE PLANS OR BY THE ENGINEER.

* INCLUDED WITH ROADWAY QUANTITIES.

DETAILED DRAWING

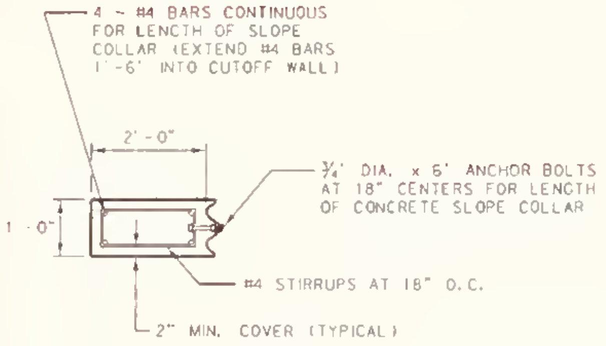
REFERENCE
STANDARD SPEC.
SECTION 603

DWG. NO.
603-28

EMBANKMENT PROTECTOR

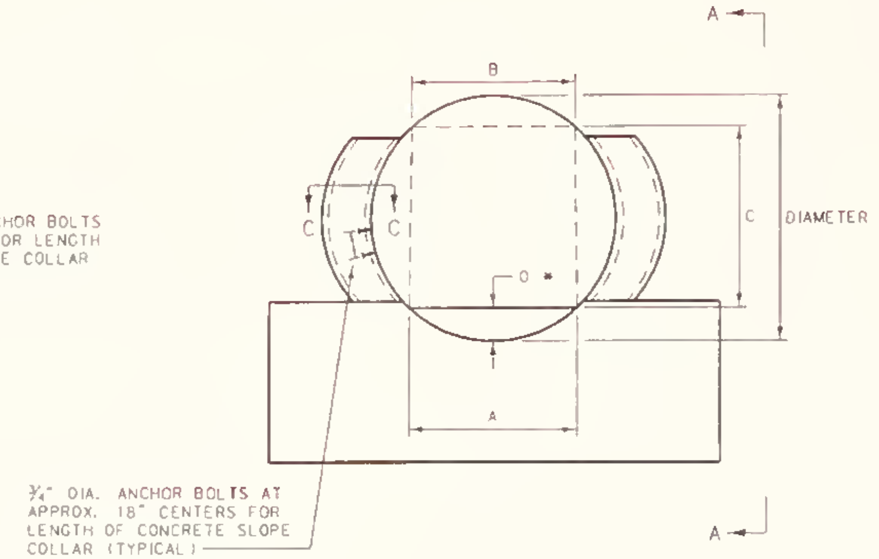
EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

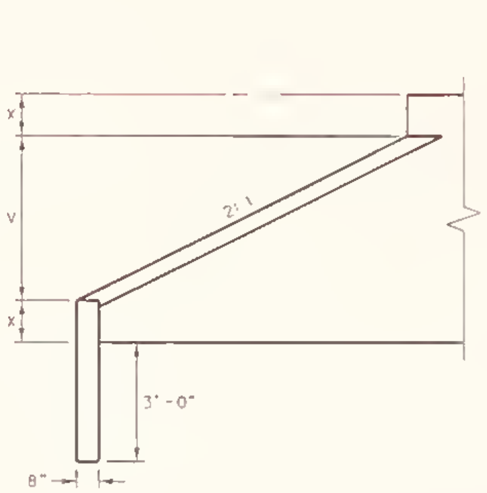

4 ~ #4 BARS CONTINUOUS FOR LENGTH OF SLOPE COLLAR (EXTEND #4 BARS 1'-6" INTO CUTOFF WALL)
2'-0"
1'-0"
¾" DIA. x 6" ANCHOR BOLTS AT 18" CENTERS FOR LENGTH OF CONCRETE SLOPE COLLAR
#4 STIRRUPS AT 18" O.C.
2" MIN. COVER (TYPICAL)

NOTE:
SEE DTL. DWG. NO. 552-00
FOR ANCHOR BOLT DETAILS.

SECTION C-C


A
B
C
C
C
DIAMETER
D *
A
¾" DIA. ANCHOR BOLTS AT APPROX. 18" CENTERS FOR LENGTH OF CONCRETE SLOPE COLLAR (TYPICAL)
A

ELEVATION



SECTION A-A

NOTES:

DESIGNATE THESE STRUCTURES, IN PLANS AND PROPOSAL, AS "VEHICULAR UNDERPASS." CONFORM MATERIALS, INSTALLATION, AND OTHER PROVISIONS TO THE STANDARD SPECIFICATIONS. USE THE TERM "VEHICULAR UNDERPASS," REGARDLESS OF THE USE OR PURPOSE OF THE STRUCTURE.

PROVIDE END TREATMENT FOR ALL VEHICULAR UNDERPASSES INCLUDING CUTOFF WALLS, BACKFILL RETAINING WALLS AND CONCRETE SLOPE COLLARS.

PROVIDE SURFACING FOR THE INSIDE OF THE STRUCTURE, CROSS-SLOPED TO ALLOW A DRAINAGE COURSE ALONG ONE SIDE.

FOR PLATE THICKNESS SEE ROAD DESIGN MANUAL FILL HEIGHT TABLES.

USE CLASS 'DD' CONCRETE OR EQUAL.

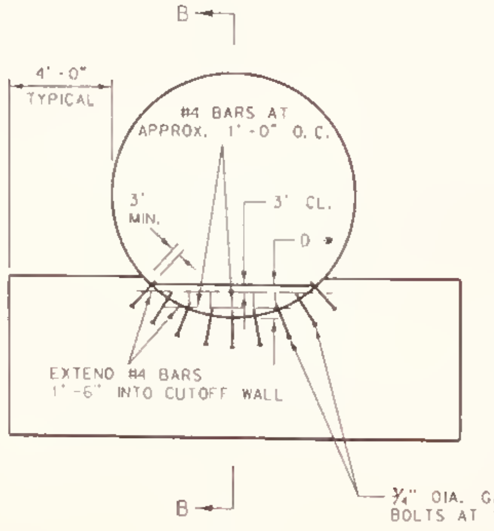
SEE DTL. DWG. NO. 552-08 FOR QUANTITIES.

DEPTH OF SURFACING *		
MATERIAL	ALTERNATE "A"	ALTERNATE "B"
PL. MIX SURF.	—	0.20'
CR. TOP SURF.	0.20'	0.20'
CR. BASE OR SELECT SURF.	BAL.	BAL.

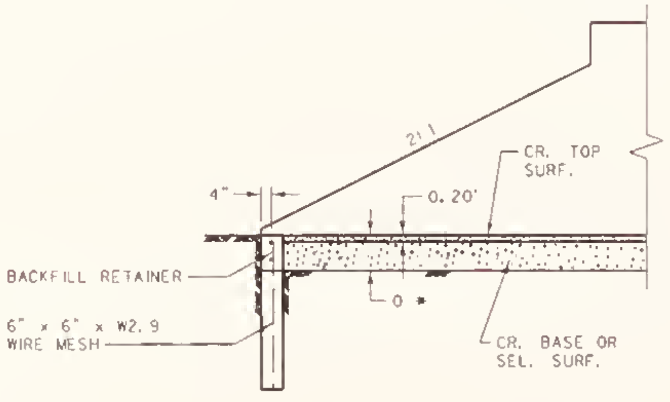
DIAMETER	A	B	C	V	X	* D	BACKFILL RETAINER (C.Y.)	CONCRETE COLLAR (C.Y.)
96"	4'	4	6.9'	4.0'	2.0'	0.5'	0.04	0.66
120"	7'	7'	7.1'	5.0'	2.5'	1.4'	0.17	0.82
150"	10'	8'	8.6'	6.25'	3.13'	2.5'	0.43	1.08
162"	10'	8'	10.0'	6.75'	3.38'	2.2'	0.38	1.16
186"	12'	10'	10.8'	7.75'	3.88'	2.9'	0.59	1.34
192"	12'	10'	11.5'	8.0'	4.0'	2.7'	0.55	1.38
204"	12'	10'	12.9'	8.5'	4.25'	2.5'	0.51	1.46
216"	12'	10'	14.2'	9.0'	4.50'	2.3'	0.47	1.54
228"	16'	12'	12.5'	9.5'	4.75'	4.4'	1.23	1.72
240"	16'	12'	14.0'	10.0'	5.0'	4.0'	1.10	1.72

	SURFACING QUANTITIES PER LINEAR FOOT FOR DEPTH "D" *								
	ALTERNATE "A"		ALTERNATE "B"						
	C.Y. SURFACING		TONS SURFACING		C.Y. SURFACING		TONS BIT. MATL.		
DIAMETER	CRUSHED TOP SURF.	CR. BASE OR SEL. SURF.	COVER MATERIAL	PLANT MIX	CRUSHED TOP SURF.	CR. BASE OR SEL. SURF.	PLANT MIX	PRIME	SEAL
96"	0.027	0.027	0.0056	0.052	0.020	0.007	0.0031	0.0005	0.0007
120"	0.050	0.205	0.0097	0.097	0.047	0.158	0.0058	0.0009	0.0012
150"	0.073	0.574	0.0139	0.141	0.070	0.504	0.0084	0.0014	0.0017
162"	0.073	0.490	0.0139	0.140	0.069	0.420	0.0084	0.0014	0.0017
186"	0.088	0.794	0.0167	0.169	0.085	0.709	0.0102	0.0017	0.0020
192"	0.087	0.743	0.0167	0.168	0.085	0.659	0.0101	0.0016	0.0020
204"	0.088	0.681	0.0167	0.169	0.084	0.596	0.0102	0.0016	0.0020
216"	0.087	0.615	0.0167	0.168	0.084	0.531	0.0101	0.0016	0.0020
228"	0.118	1.724	0.0222	0.227	0.116	1.609	0.0136	0.0022	0.0026
240"	0.117	1.539	0.0222	0.226	0.115	1.424	0.0136	0.0022	0.0026

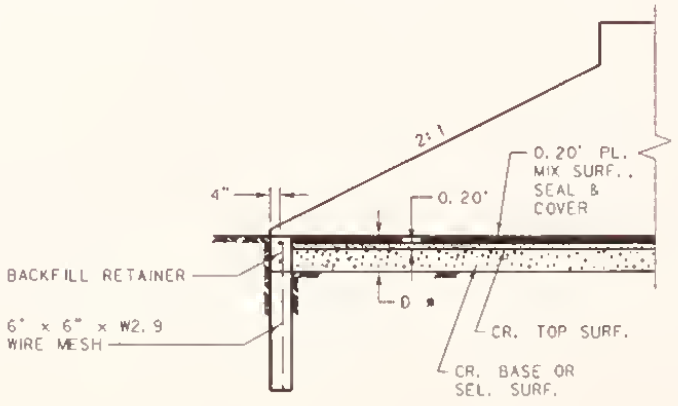
BACKFILL RETAINER & CUTOFF WALL DETAIL


B
4'-0"
TYPICAL
#4 BARS AT APPROX. 1'-0" O.C.
3" MIN.
3" CL.
D *
EXTEND #4 BARS 1'-6" INTO CUTOFF WALL
¾" DIA. GALV. ANCHOR BOLTS AT 1'-6" O.C.
B

ELEVATION



SECTION B-B
(ALTERNATE "A")



SECTION B-B
(ALTERNATE "B")

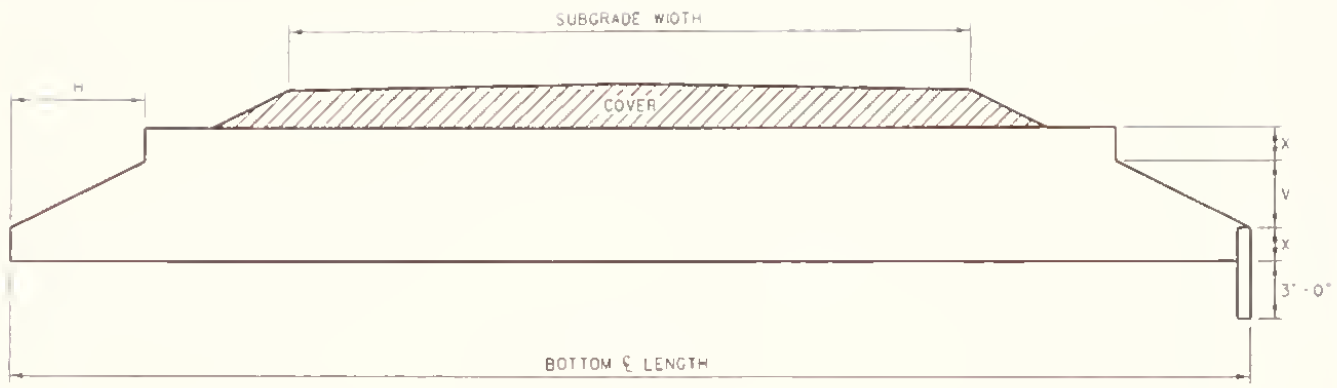
NOTE:
INCLUDE CONCRETE COLLAR WHEN SPECIFIED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 552.603
DWG. NO.
603-30

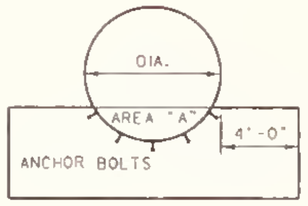
VEHICULAR UNDERPASS AND
BACKFILL RETAINER
& CUTOFF WALL DETAIL

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



NOTE:
FOR DETAILS COVERING CUTOFF WALLS
SEE DTL. DWG. NO. 552-00.



DIA.	X (FT.)	V (FT.)	H (FT.) FOR BEVELS: 1.5:1	H (FT.) FOR BEVELS: 2:1	AREA "A" (SQ. FT.) ◆
CSP 3" × 1" OR 5" × 1" CORRUGATIONS					
48"	1.000	2.000	3.000	4.000	2.63
54"	1.125	2.250	3.375	4.500	3.31
60"	1.250	2.500	3.750	5.000	4.06
66"	1.375	2.750	4.125	5.500	4.89
72"	1.500	3.000	4.500	6.000	5.79
78"	1.625	3.250	4.875	6.500	6.77
84"	1.750	3.500	5.250	7.000	7.83
90"	1.875	3.750	5.625	7.500	8.97
96"	2.000	4.000	6.000	8.000	10.18
102"	2.125	4.250	6.375	8.500	11.47
108"	2.250	4.500	6.750	9.000	12.83
114"	2.375	4.750	7.125	9.500	14.27
120"	2.500	5.000	7.500	10.000	15.79

DIA.	X (FT.)	V (FT.)	H (FT.) FOR BEVELS: 1.5:1	H (FT.) FOR BEVELS: 2:1	AREA "A" (SQ. FT.) ◆
SSPP 6" × 2" CORRUGATIONS					
126"	2.625	5.250	7.875	10.500	17.39
132"	2.750	5.500	8.250	11.000	19.06
138"	2.875	5.750	8.625	11.500	20.81
144"	3.000	6.000	9.000	12.000	22.64
150"	3.125	6.250	9.375	12.500	24.54
156"	3.250	6.500	9.750	13.000	26.52
162"	2.375	6.750	10.125	13.500	28.58
168"	3.500	7.000	10.500	14.000	30.71
174"	3.625	7.250	10.875	14.500	32.92
180"	3.750	7.500	11.250	15.000	35.21
186"	3.875	7.750	11.625	15.500	37.57
192"	4.000	8.000	12.000	16.000	40.01
198"	4.125	8.250	12.375	16.500	42.53
204"	4.250	8.500	12.750	17.000	45.12
210"	4.375	8.750	13.125	17.500	47.79
216"	4.500	9.000	13.500	18.000	50.54
228"	4.750	9.500	14.250	19.000	56.26
240"	5.000	10.000	15.000	20.000	62.29
252"	5.250	10.500	15.750	21.000	68.63

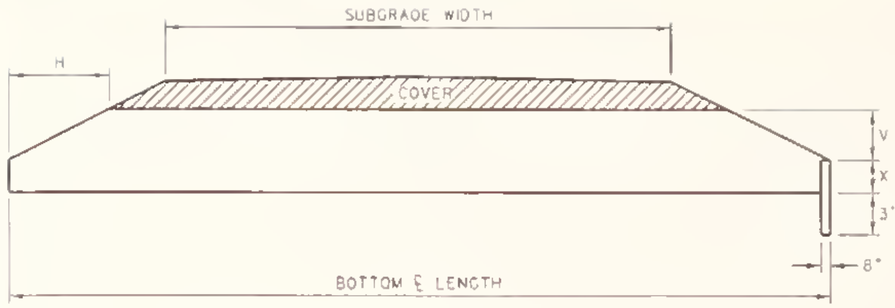
◆ AREA "A" IS TO THE MIDDLE OF THE CORRUGATIONS.

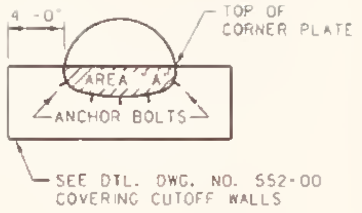
DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 603
DWG. NO.
603-32

STEP BEVEL FOR
CIRCULAR METAL CULVERT

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD





SPAN	RISE	EQUIV. DIA.	X (FT.)	V (FT.)	H (FT.) FOR BEVELS: 1.5:1	H (FT.) FOR BEVELS: 2:1	H (FT.) FOR BEVELS: 2.5:1	AREA "A" (SQ. FT.)
SSPPA 6" × 2" CORRUGATIONS WITH 18" CORNER RADIUS								
6'-1"	4'-7"	66"	2.3	2.3	3.4	4.6	5.7	12.8
6'-9"	4'-11"	72"	2.4	2.5	3.8	5.0	6.3	14.8
7'-3"	5'-3"	78"	2.1	3.2	4.7	6.3	7.9	14.1
7'-11"	5'-7"	84"	2.3	3.3	4.9	6.6	8.2	16.8
8'-7"	5'-11"	90"	2.3	3.6	5.4	7.2	9.0	18.0
9'-4"	6'-3"	96"	2.5	3.8	5.6	7.5	9.4	21.0
9'-9"	6'-7"	102"	2.2	4.4	6.6	8.8	11.0	19.8
10'-8"	6'-11"	108"	2.8	4.1	6.2	8.2	10.3	26.6
11'-5"	7'-3"	114"	2.8	4.5	6.7	8.9	11.1	27.9
11'-10"	7'-7"	120"	2.5	5.1	7.6	10.2	13.6	26.4
12'-6"	7'-11"	126"	2.7	5.2	7.8	10.4	13.0	30.0
12'-10"	8'-4"	132"	2.3	6.0	8.9	11.9	14.9	26.9
SSPPA 6" × 2" CORRUGATIONS WITH 31" CORNER RADIUS								
13'-3"	9'-4"	~	3.9	5.5	8.2	10.9	13.6	45.7
13'-6"	9'-6"	~	3.8	5.7	8.6	11.5	14.3	45.7
14'-0"	9'-8"	144"	4.0	5.7	8.5	11.4	14.2	49.1
14'-3"	9'-10"	~	3.8	6.1	9.1	12.1	15.2	47.6
14'-5"	10'-0"	~	3.7	6.3	9.5	12.7	15.9	47.4
14'-11"	10'-2"	~	4.0	6.2	9.3	12.4	15.5	52.4
15'-4"	10'-4"	156"	4.3	6.0	9.1	12.1	15.1	57.6
15'-7"	10'-6"	~	4.1	6.4	9.6	12.8	16.1	55.9
15'-10"	10'-8"	~	3.9	6.8	10.2	13.6	17.0	54.2
16'-3"	10'-10"	~	4.3	6.5	9.8	13.1	16.4	61.1
16'-6"	11'-0"	168"	4.1	6.9	10.4	13.9	17.3	59.4
17'-0"	11'-2"	~	4.4	6.8	10.2	13.6	17.0	64.7
17'-2"	11'-4"	~	4.3	7.1	10.6	14.1	17.6	64.6
17'-5"	11'-6"	~	4.1	7.4	11.2	14.9	18.6	62.6
17'-11"	11'-8"	180"	4.3	7.4	11.1	14.8	18.5	66.6
18'-1"	11'-10"	~	4.2	7.7	11.5	15.3	19.2	66.4
18'-7"	12'-0"	~	4.5	7.5	11.3	15.0	18.8	72.2
18'-9"	12'-2"	~	4.3	7.9	11.8	15.8	19.7	70.1
19'-3"	12'-4"	192"	4.6	7.7	11.6	15.5	19.4	76.3
19'-6"	12'-6"	~	4.4	8.1	12.2	16.3	20.3	74.1
19'-8"	12'-8"	~	4.3	8.4	12.6	16.8	21.0	73.7
19'-11"	12'-10"	~	4.1	8.8	13.2	17.6	22.0	71.3
20'-5"	13'-0"	204"	4.4	8.6	12.9	17.3	21.6	77.6
20'-7"	13'-2"	~	4.3	8.9	13.4	17.8	22.3	77.2

SPAN	RISE	EQUIV. DIA.	X (FT.)	V (FT.)	H (FT.) FOR BEVELS: 1.5:1	H (FT.) FOR BEVELS: 2:1	H (FT.) FOR BEVELS: 2.5:1	AREA "A" (SQ. FT.)
CSPA 3" × 1" CORRUGATIONS (SEE NOTE ⊗)								
60"	46"	54"	1.7	2.3	3.5	4.7	5.8	7.1
66"	51"	60"	1.9	2.6	3.9	5.2	6.5	8.7
73"	55"	66"	2.1	2.8	4.1	5.5	6.9	10.7
81"	59"	72"	2.0	3.2	4.8	6.5	8.1	11.1
87"	63"	78"	2.1	3.5	5.2	6.9	8.6	13.2
95"	67"	84"	2.3	3.7	5.5	7.3	9.2	15.3
103"	71"	90"	2.5	3.9	5.8	7.7	9.6	17.8
112"	75"	96"	2.6	4.1	6.1	8.1	10.2	20.2
117"	79"	102"	2.8	4.3	6.4	8.5	10.7	23.1
128"	83"	108"	3.0	4.5	6.7	8.9	11.2	25.9
137"	87"	114"	3.1	4.7	7.0	9.4	11.7	29.0
142"	91"	120"	3.3	4.9	7.3	9.7	12.2	32.2
CSPA 2⅔" × ½" CORRUGATIONS (SEE NOTE ⊗)								
57"	38"	48"	1.1	2.1	3.1	4.2	5.2	4.5
64"	43"	54"	1.2	2.4	3.5	4.7	5.9	5.6
71"	47"	60"	1.4	2.6	3.8	5.1	6.4	6.9
77"	52"	66"	1.5	2.8	4.3	5.7	7.1	8.2
83"	57"	72"	1.6	3.1	4.7	6.3	7.8	9.6

NOTES:

BEVEL TO TOP OF CORNER PLATE.

PIPE ENDS ARE SQUARE (PERPENDICULAR TO CENTERLINE OF PIPE) AND FILL SLOPES ARE WARPED TO ACCOMMODATE THE SQUARE ENDS UNLESS SPECIFIED OTHERWISE ON PLANS.

⊗ TABULATED VALUES BASED ON NOMINAL PIPE DIMENSIONS. IN PLACE DIMENSIONS SUBJECT TO TOLERANCES LISTED IN CURRENT AASHTO M 36 AND M 196.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 603
DWG. NO.
603-34

BEVEL ON ARCH
METAL CULVERT

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

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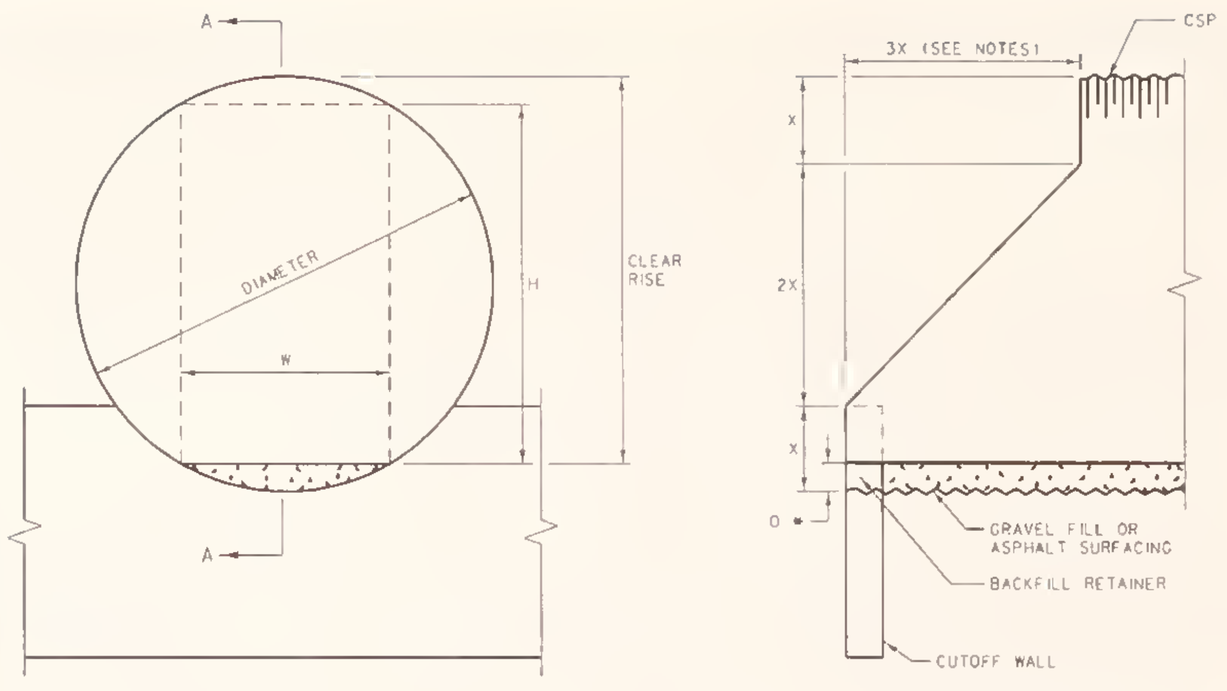


SECTION A-A

DIAMETER	X	* D	CLEAR RISE	H	W	BACKFILL RETAINER (CUBIC YARDS)
84"	21.0"	0.50'	6.5'	6.0'	3.6'	0.1
90"	22.5"	0.75'	6.75'	6.0'	4.5'	0.1
96"	24.0"	0.83'	7.17'	6.34'	4.9'	0.1

	SURFACING QUANTITIES PER LINEAR FOOT FOR DEPTH "D" *				
	FULL DEPTH GRAVEL	0.20' PMS AND REMAINING DEPTH GRAVEL			
	C.Y. SURF.	TONS SURF.	C.Y. SURF.	TONS BIT. MATERIAL	
DIAMETER	CR. TOP SURF.	PLANT MIX	CR. TOP SURF.	PLANT MIX	PRIME
84"	0.045	0.046	0.021	0.0028	0.0004
90"	0.085	0.060	0.054	0.0036	0.0006
96"	0.102	0.066	0.068	0.0040	0.0006

NOTES:

UNLESS OTHERWISE SPECIFIED, INSTALL STOCKPASSES WITH CUTOFF WALLS AND BACKFILL RETAINERS AT EACH END, GRAVEL FILL AND BEDDING MATERIAL.

WHEN SPECIFIED, INSTALL COMBINATION STOCKPASSES AND DRAINS WITH CUTOFF WALLS, BACKFILL RETAINERS AT BOTH ENDS, CONCRETE EDGE PROTECTION AT THE INLET END, RANDOM RIPRPAP AT THE OUTLET END, BEDDING MATERIAL AND ASPHALT SURFACING: CROSS SLOPE ASPHALT SURFACING TO ALLOW DRAINAGE COURSE ALONG ONE SIDE. (SEE DTL. DWG. NO. 613-14 AND 613-06.)

UNLESS OTHERWISE SPECIFIED, STEP BEVEL PIPE ENDS AT A 1.5:1 SLOPE.

THE MINIMUM THICKNESS FOR CORRUGATED STEEL PIPE STOCKPASS IS 0.079". (SEE FILL HEIGHT TABLES FOR OTHER THAN THE MINIMUM REQUIREMENTS.)

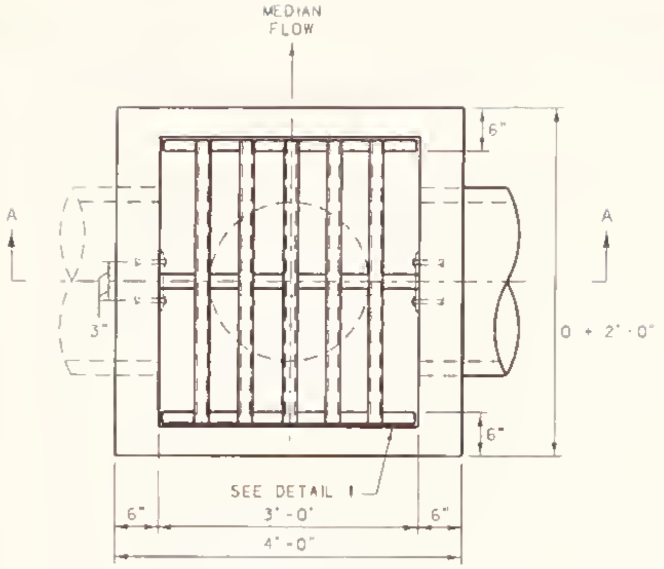
SEE DTL. DWG. NO. 552-00, 603-30 AND 603-18.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 603
DWG. NO.
603-36

CORRUGATED STEEL
PIPE STOCKPASS

EFFECTIVE: AUGUST 1999

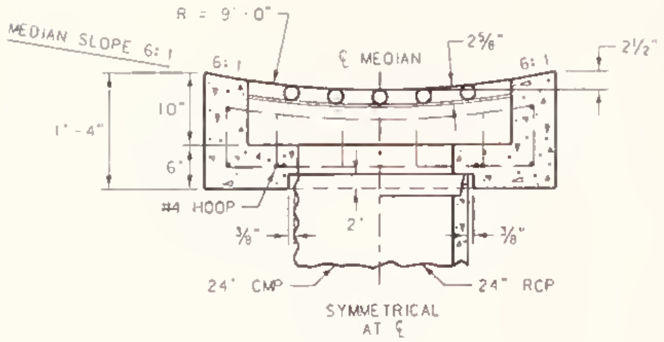
MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



PLAN VIEW

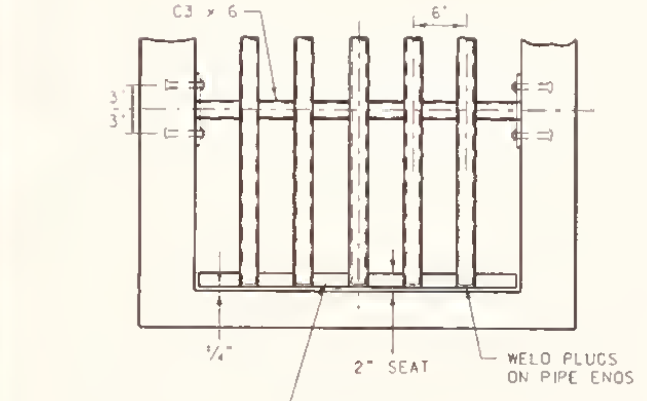
TYPICAL FOR TYPES 1, 2 AND 3

NOTE:
WHEN MEDIAN INLET COVER IS INSTALLED OVER PIPES LARGER THAN 36", WITHOUT ADEQUATE COVER TO PERMIT THE USE OF TYPE 1 INSTALLATION, PROVIDE A DETAIL OF THE INSTALLATION IN THE PLANS.

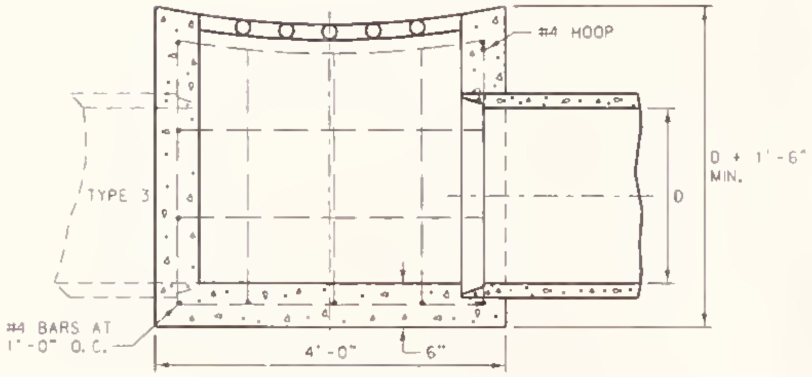


SECTION A-A

TYPE 1

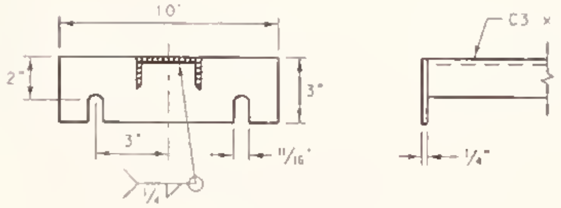


DETAIL 1

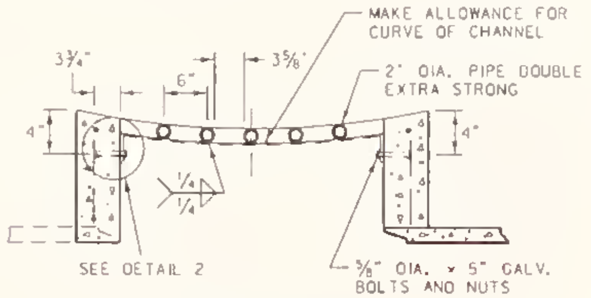


SECTION A-A

TYPE 2 HAS 1 PIPE CONNECTION
TYPE 3 HAS 2 PIPE CONNECTIONS



DETAIL 2


MAKE ALLOWANCE FOR CURVE OF CHANNEL
2" DIA. PIPE DOUBLE EXTRA STRONG
3¾"
6"
3⅝"
4"
4"
¼
¼
SEE DETAIL 2
⅝" DIA. × 5" GALV. BOLTS AND NUTS

COVER DETAIL

TYPES 2 & 3

GRATE AND REINFORCING STEEL (LB.) *			
TYPE	CMP AND RCP		
	24"	30"	36"
1	50	~	~
2	85	95	105
3	85 ⊛	95 ⊛	105 ⊛
GRATE	165	185	210

CLASS "DD" CONC. OR EQUAL (C.Y.) *						
TYPE	24"		30"		36"	
	CMP	RCP	CMP	RCP	CMP	RCP
1	0.4	0.4	~	~	~	~
2	1.0	1.0	1.1	1.0	1.2	1.1
3	0.9 ⊛	0.9 ⊛	1.0 ⊛	0.9 ⊛	1.0 ⊛	0.9 ⊛

* QUANTITIES ARE FOR ESTIMATING PURPOSES ONLY.
⊛ TYPE 3 IS A SPECIAL CASE TO BE FIGURED FOR THE PARTICULAR INSTALLATION.

NOTE:
PAINT ALL EXPOSED METAL PARTS WITH ONE COAT OF ZINC RICH PAINT AND TWO COATS OF ALUMINUM PAINT IN ACCORDANCE WITH SECTION 710 OF THE STANDARD SPECIFICATIONS.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 604
DWG. NO.
604-00

MEDIAN INLET COVER

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

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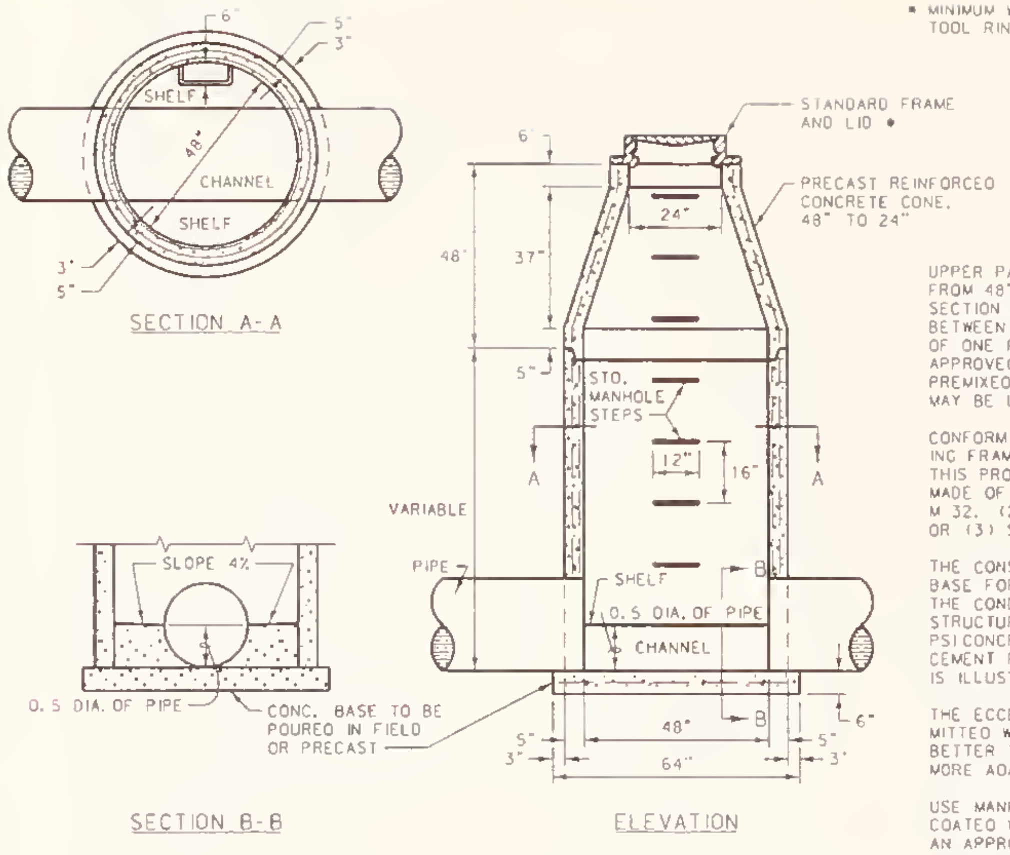
* MINIMUM WEIGHT FOR FRAME AND LID IS 400 LB. TOOL RING AND COVER TO A MACHINE FIT.



SECTION A-A

SECTION B-B

ELEVATION

TYPE 1 MANHOLE

UPPER PART IS A CONE TO REDUCE DIAMETER FROM 48" TO 24". CUT BOTTOM OF LOWER SECTION SQUARE TO FIT BASE. GROUT JOINT BETWEEN BASE AND WALL. A GROUT CONSISTING OF ONE PART PORTLAND CEMENT AND TWO PARTS APPROVED SAND MAYBE USED; AN APPROVED PREMIXED GROUT, AVAILABLE COMMERCIALLY, MAY BE USED.

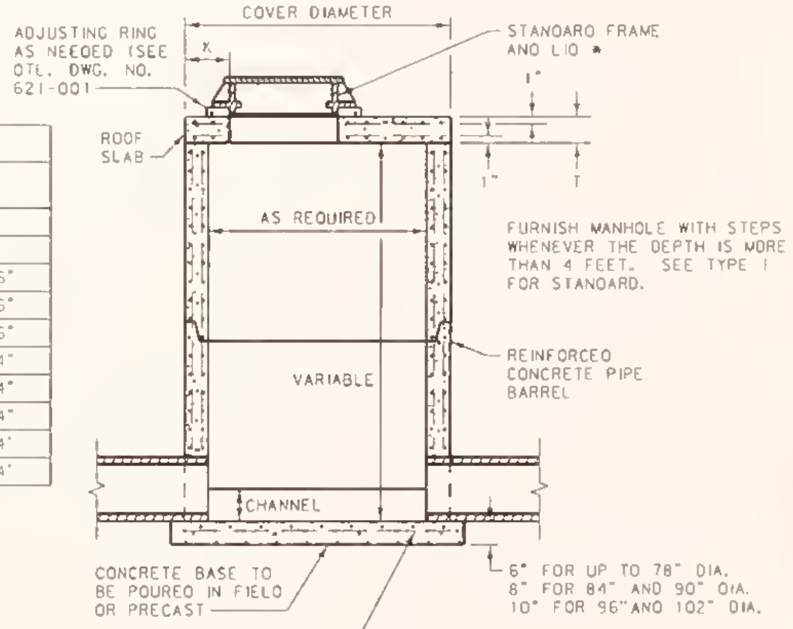
CONFORM ALL MANHOLE CONSTRUCTION, EXCEPTING FRAME, LID, AND BASE, TO AASHTO M 199. THIS PROVIDES THAT REINFORCEMENT MAY BE MADE OF (1) COLD DRAWN STEEL WIRE- AASHTO M 32, (2) STEEL WIRE FABRIC- AASHTO M 55, OR (3) STEEL BARS- AASHTO M 31.

THE CONSTRUCTION AND REINFORCEMENT OF THE BASE FOR EACH TYPE MUST BE COMPATIBLE WITH THE CONDITIONS AND THE WEIGHT OF THE SUPERSTRUCTURE. AASHTO M 199 PROVIDES FOR 4000 PSI CONCRETE. THE MIX CALLS FOR 6 SACKS OF CEMENT PER CUBIC YARD. REINFORCEMENT SHOWN IS ILLUSTRATIVE ONLY. SEE AASHTO M 199.

THE ECCENTRIC CONE TRANSITION WILL BE PERMITTED WHEN ITS USE WILL BE AS GOOD OR BETTER THAN THE ONES SHOWN, OR IF IT IS MORE ADAPTABLE TO EXISTING CONDITIONS.

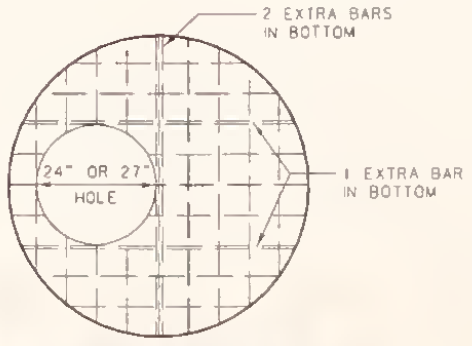
USE MANHOLE STEPS THAT ARE METALLIC AND COATED WITH COPOLYMER POLYPROPYLENE, OR AN APPROVED EQUAL. THE MINIMUM DESIGN LIVE LOAD FOR A SINGLE CONCENTRATED LOAD IS 300 POUNDS.

TYPE 3 MANHOLE ROOF SLAB					
PIPE DIA.	SLAB DIA.	T	K	BOTTOM BARS	TOP BARS
48"	58"	6"	6"	#4 AT 6"	~
54"	65"	8"	6"	#4 AT 6"	~
60"	72"	8"	7"	#4 AT 6"	#3 AT 6"
66"	79"	8"	7"	#4 AT 6"	#3 AT 6"
72"	86"	8"	8"	#4 AT 6"	#3 AT 6"
78"	93"	8"	8"	#4 AT 4"	#4 AT 4"
84"	100"	8"	9"	#4 AT 4"	#4 AT 4"
90"	107"	8"	9"	#4 AT 4"	#4 AT 4"
96"	114"	8"	9"	#5 AT 4"	#4 AT 4"
102"	121"	8"	9"	#5 AT 4"	#4 AT 4"


ADJUSTING RING AS NEEDED (SEE DTL. DWG. NO. 621-001)
COVER DIAMETER
K
STANDARD FRAME AND LID *
ROOF SLAB
1"
1"
T
AS REQUIRED
VARIABLE
REINFORCED CONCRETE PIPE BARREL
CHANNEL
CONCRETE BASE TO BE POURED IN FIELD OR PRECAST
#4 BARS AT 12" O.C. EACH WAY
6" FOR UP TO 78" DIA.
8" FOR 84" AND 90" DIA.
10" FOR 96" AND 102" DIA.

FURNISH MANHOLE WITH STEPS WHENEVER THE DEPTH IS MORE THAN 4 FEET. SEE TYPE 1 FOR STANDARD.

TYPE 3 MANHOLE



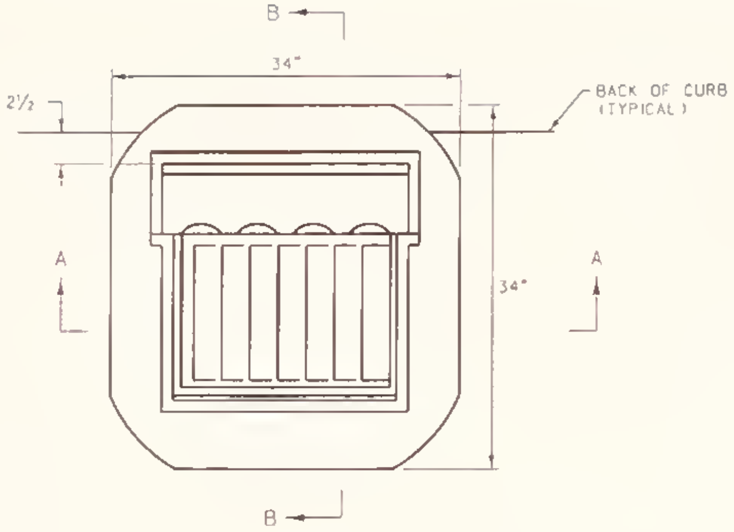
TYPE 3 MANHOLE ROOF SLAB

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 604.711
DWG. NO.
604-02

CONCRETE MANHOLE

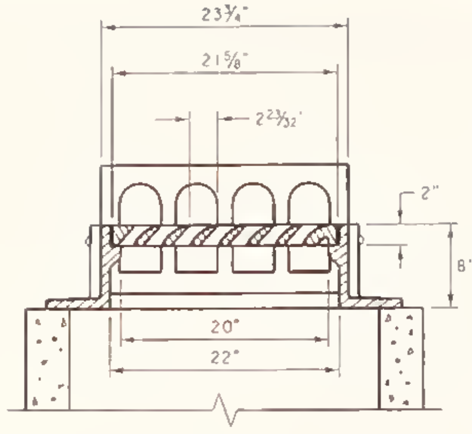
EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

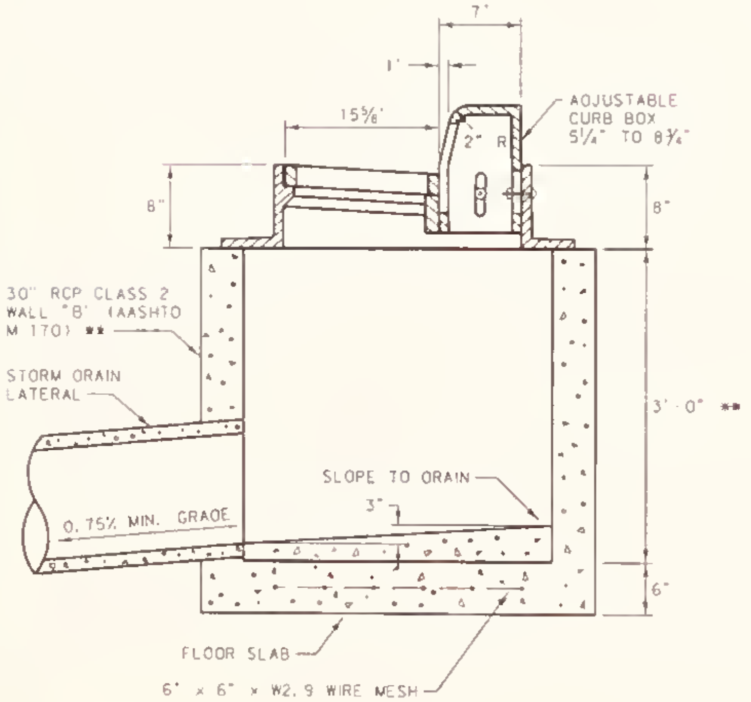


PLAN

NEENAH FOUNDRY R-3286-8V (JUNE 1992 REVISION) OR APPROVED EQUAL (VANE STYLE)



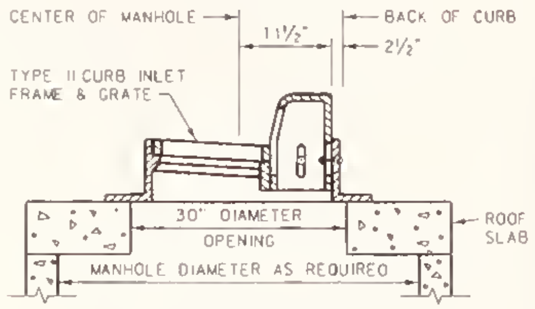
SECTION A-A

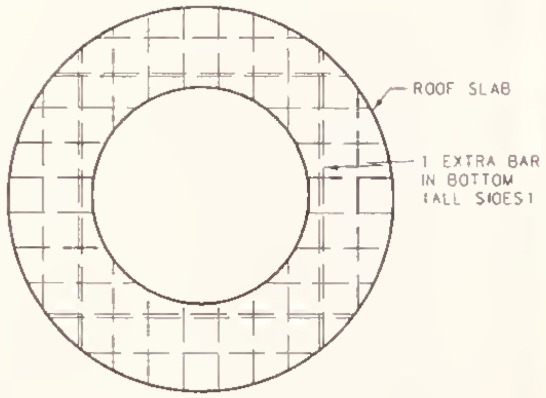


SECTION B-B

** STANDARD UNLESS OTHERWISE NOTED ON THE PLANS.

COMBINATION





ROOF SLAB

SEE DETAILED DRAWING NO. 604-02 FOR DIAMETER, SLAB THICKNESS AND REINFORCING REQUIREMENTS FOR COMBINATION TYPE 3 MANHOLE, TYPE II CURB INLET.

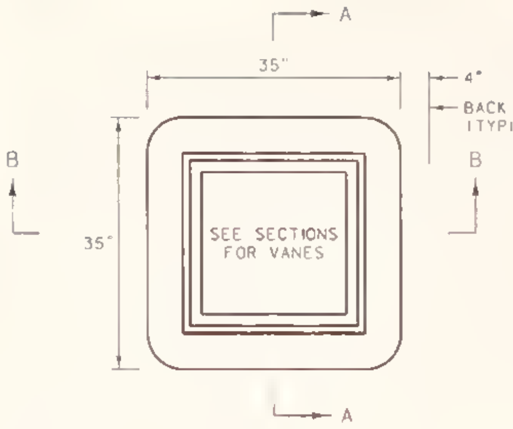
NOTE:
ALL CONCRETE IS CLASS "DD" OR APPROVED EQUAL.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 604
DWG. NO.
604-03

CURB INLET
TYPE II

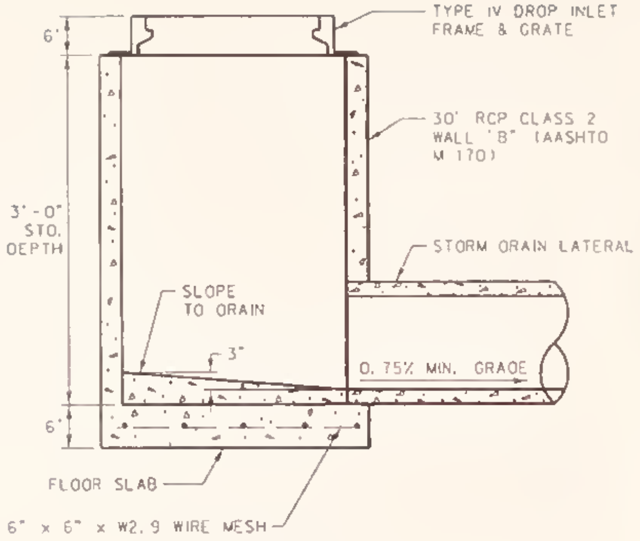
EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

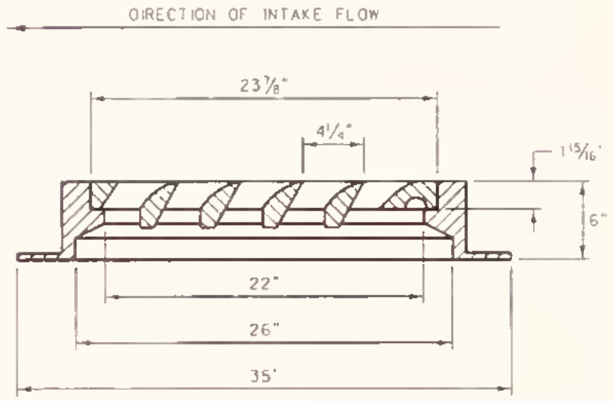


PLAN

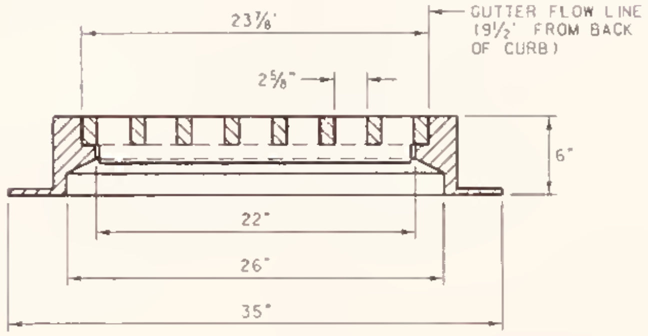
NEENAH CASTING R-3210-L (VANE STYLE) OR APPROVED EQUAL



SINGLE DROP INLET
TYPE IV

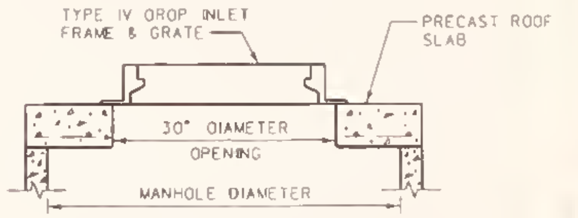


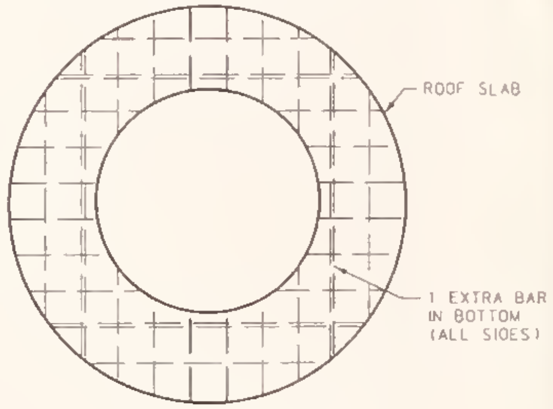
SECTION A-A



SECTION B-B

COMBINATION





ROOF SLAB

SEE DETAILED DRAWING NO. 604-02 FOR DIAMETER, SLAB THICKNESS AND REINFORCING REQUIREMENTS FOR COMBINATION TYPE 3 MANHOLE, TYPE IV DROP INLET.

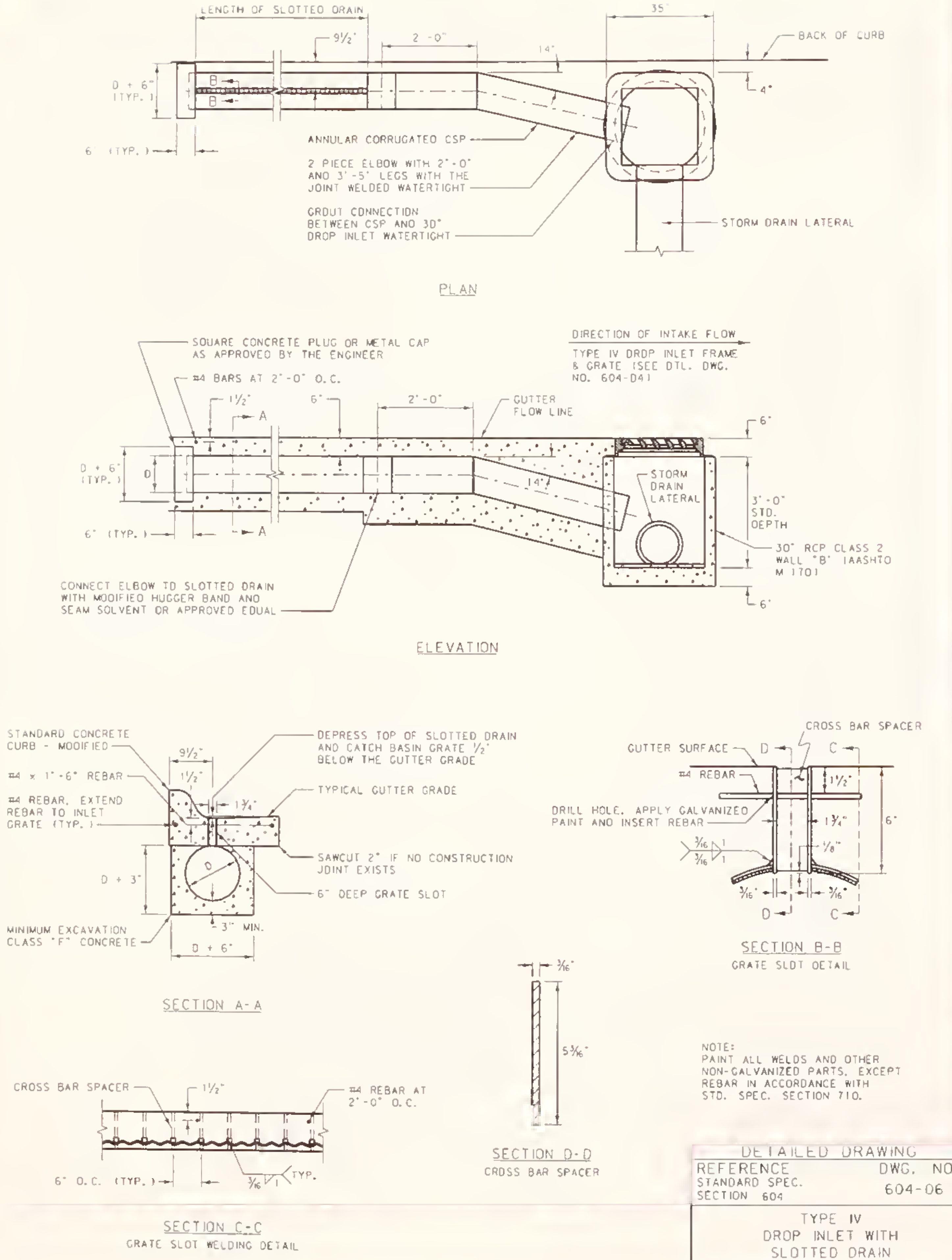
NOTE:
ALL CONCRETE IS CLASS "DD" OR APPROVED EQUAL.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 604
DWG. NO.
604-04

DROP INLET
TYPE IV

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD


LENGTH OF SLOTTED DRAIN
9½"
2'-0"
35"
14"
BACK OF CURB
4"
D + 6" (TYP.)
B
B
6" (TYP.)
ANNULAR CORRUGATED CSP
2 PIECE ELBOW WITH 2'-0" AND 3'-5" LEGS WITH THE JOINT WELDED WATERTIGHT
GROUT CONNECTION BETWEEN CSP AND 30" DROP INLET WATERTIGHT
STORM DRAIN LATERAL
SQUARE CONCRETE PLUG OR METAL CAP AS APPROVED BY THE ENGINEER
DIRECTION OF INTAKE FLOW
TYPE IV DROP INLET FRAME & GRATE (SEE DTL. DWG. NO. 604-04)
#4 BARS AT 2'-0" O.C.
1½"
A
6"
2'-0"
GUTTER FLOW LINE
6"
D + 6" (TYP.)
D
14"
STORM DRAIN LATERAL
3'-0" STD. DEPTH
30" RCP CLASS 2 WALL "B" (AASHTO M 170)
6" (TYP.)
A
6"
CONNECT ELBOW TO SLOTTED DRAIN WITH MODIFIED HUGGER BAND AND SEAM SOLVENT OR APPROVED EQUAL
STANDARD CONCRETE CURB - MODIFIED
9½"
1½"
#4 x 1'-6" REBAR
#4 REBAR, EXTEND REBAR TO INLET GRATE (TYP.)
DEPRESS TOP OF SLOTTED DRAIN AND CATCH BASIN GRATE ½" BELOW THE GUTTER GRADE
1¾"
TYPICAL GUTTER GRADE
SAWCUT 2" IF NO CONSTRUCTION JOINT EXISTS
D
D + 3"
6" DEEP GRATE SLOT
3" MIN.
MINIMUM EXCAVATION CLASS "F" CONCRETE
D + 6"
CROSS BAR SPACER
GUTTER SURFACE
D
C
#4 REBAR
1½"
DRILL HOLE, APPLY GALVANIZED PAINT AND INSERT REBAR
1¾"
6"
⅛"
3/16
3/16
3/16"
3/16"
D
C
3/16"
5 3/16"
CROSS BAR SPACER
1½"
#4 REBAR AT 2'-0" O.C.
6" O.C. (TYP.)
3/16
TYP.

PLAN

ELEVATION

SECTION A-A

SECTION B-B

GRATE SLOT DETAIL

SECTION D-D

CROSS BAR SPACER

SECTION C-C

GRATE SLOT WELDING DETAIL

NOTE:
PAINT ALL WELDS AND OTHER NON-GALVANIZED PARTS, EXCEPT REBAR IN ACCORDANCE WITH STD. SPEC. SECTION 710.

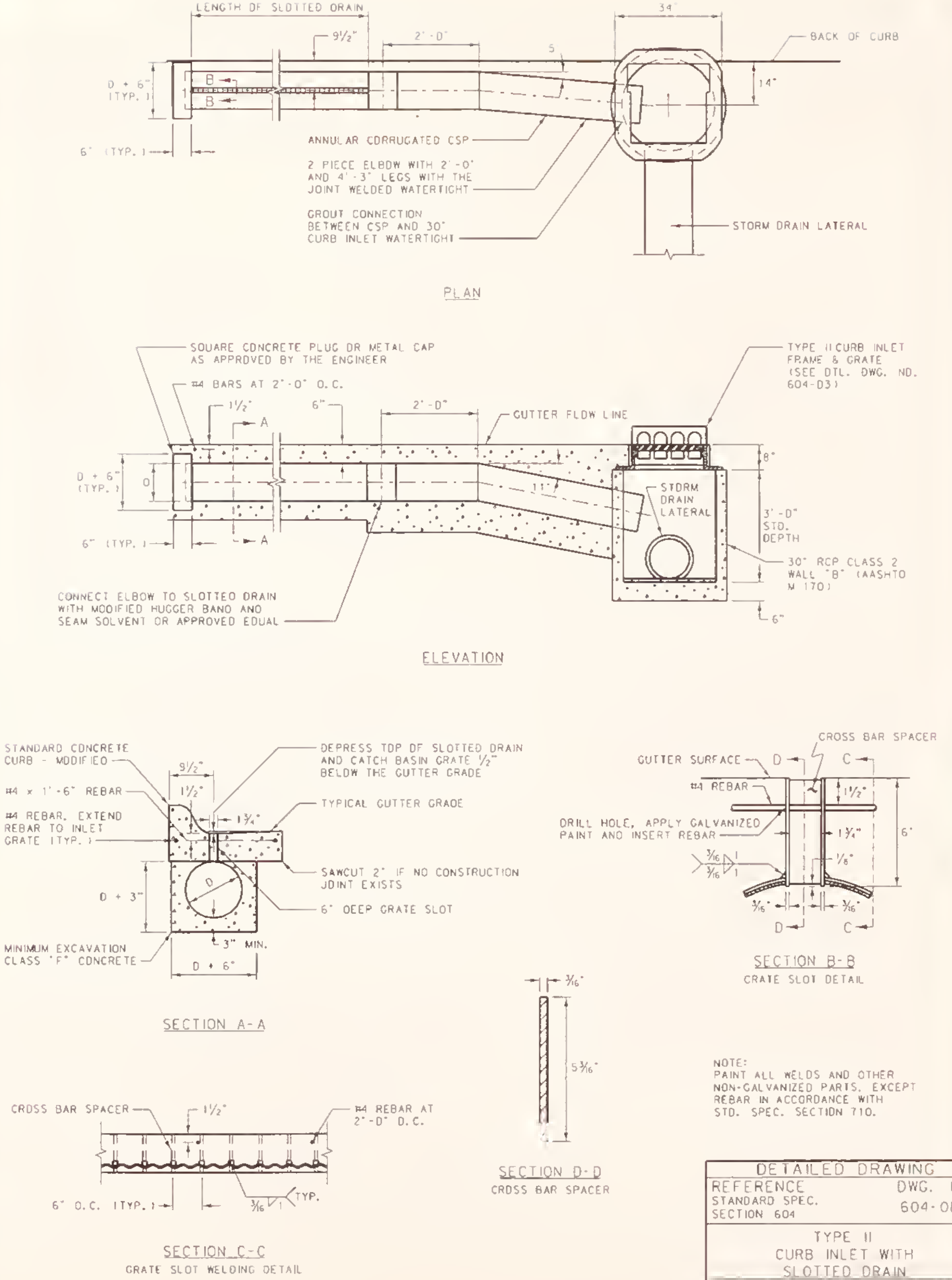
DETAILED DRAWING

REFERENCE	DWG. NO.
STANDARD SPEC. SECTION 604	604-06

TYPE IV
DROP INLET WITH
SLOTTED DRAIN

EFFECTIVE: AUGUST 1999

MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD


LENGTH OF SLOTTED DRAIN
9½"
2'-0"
34"
5
BACK OF CURB
14"
D + 6" (TYP.)
B
B
6" (TYP.)
ANNULAR CORRUGATED CSP
2 PIECE ELBOW WITH 2'-0" AND 4'-3" LEGS WITH THE JOINT WELDED WATERTIGHT
GROUT CONNECTION BETWEEN CSP AND 30" CURB INLET WATERTIGHT
STORM DRAIN LATERAL
SQUARE CONCRETE PLUG OR METAL CAP AS APPROVED BY THE ENGINEER
TYPE II CURB INLET FRAME & GRATE (SEE DTL. DWG. NO. 604-03)
#4 BARS AT 2'-0" O.C.
1½"
A
6"
2'-0"
GUTTER FLOW LINE
8"
D + 6" (TYP.)
D
11"
STORM DRAIN LATERAL
3'-0" STD. DEPTH
30" RCP CLASS 2 WALL "B" (AASHTO M 170)
6" (TYP.)
A
6"
CONNECT ELBOW TO SLOTTED DRAIN WITH MODIFIED HUGGER BAND AND SEAM SOLVENT OR APPROVED EQUAL
STANDARD CONCRETE CURB - MODIFIED
9½"
1½"
#4 x 1'-6" REBAR
#4 REBAR, EXTEND REBAR TO INLET GRATE (TYP.)
DEPRESS TOP OF SLOTTED DRAIN AND CATCH BASIN GRATE ½" BELOW THE GUTTER GRADE
1¾"
TYPICAL GUTTER GRADE
SAWCUT 2" IF NO CONSTRUCTION JOINT EXISTS
D
D + 3"
6" DEEP GRATE SLOT
3" MIN.
MINIMUM EXCAVATION CLASS "F" CONCRETE
D + 6"
CROSS BAR SPACER
GUTTER SURFACE
D
C
#4 REBAR
1½"
DRILL HOLE, APPLY GALVANIZED PAINT AND INSERT REBAR
1¾"
6"
⅛"
3/16
3/16
3/16"
3/16"
D
C
3/16"
5 3/16"
CROSS BAR SPACER
1½"
#4 REBAR AT 2'-0" O.C.
6" O.C. (TYP.)
3/16
TYP.

PLAN

ELEVATION

SECTION A-A

SECTION B-B

GRATE SLOT DETAIL

SECTION D-D

CROSS BAR SPACER

SECTION C-C

GRATE SLOT WELDING DETAIL

NOTE:
PAINT ALL WELDS AND OTHER NON-GALVANIZED PARTS, EXCEPT REBAR IN ACCORDANCE WITH STD. SPEC. SECTION 710.

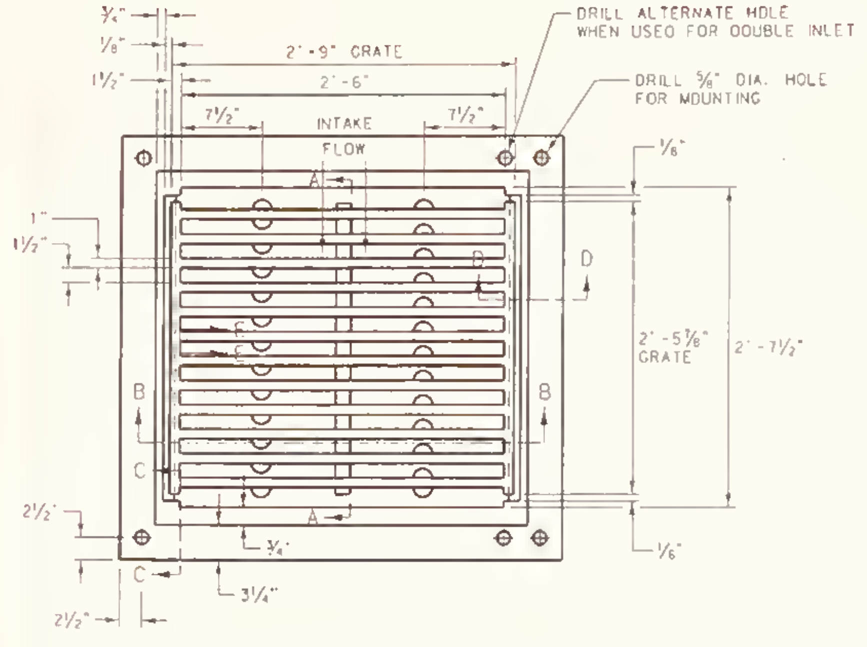
DETAILED DRAWING

REFERENCE	DWG. NO.
STANDARD SPEC. SECTION 604	604-08

TYPE II
CURB INLET WITH
SLOTTED DRAIN

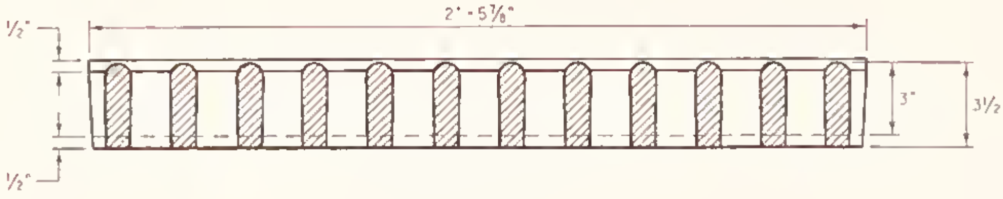
EFFECTIVE: AUGUST 1999

MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

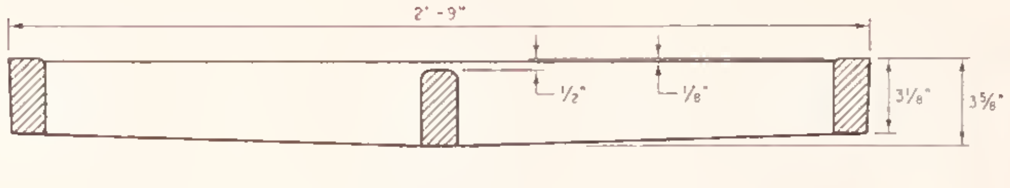

DRILL ALTERNATE HOLE WHEN USED FOR DOUBLE INLET
DRILL ⅝" DIA. HOLE FOR MOUNTING
2'-9" GRATE
2'-6"
7½"
7½"
INTAKE FLOW
2'-5⅞" GRATE
2'-7½"
A
B
C
D
E
⅛"
¾"
1"
1½"
2½"
3¼"

PLAN

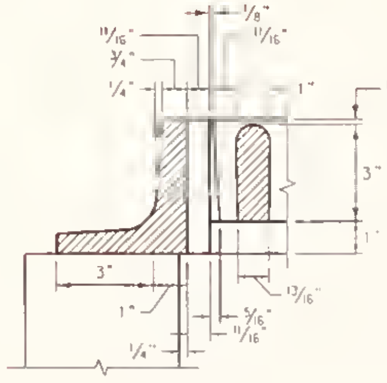
NOTE: INSTALL GRATE WITH BARS PERPENDICULAR TO INTAKE FLOW



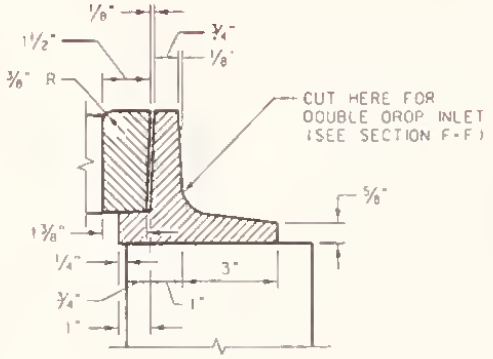
SECTION A-A
GRATE



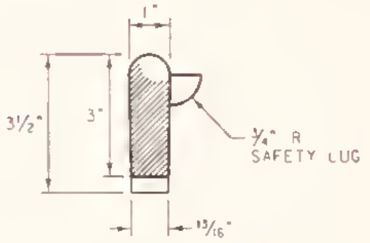
SECTION B-B
GRATE



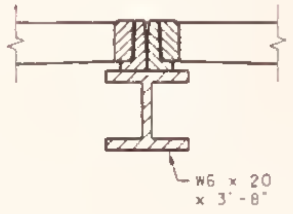
SECTION C-C



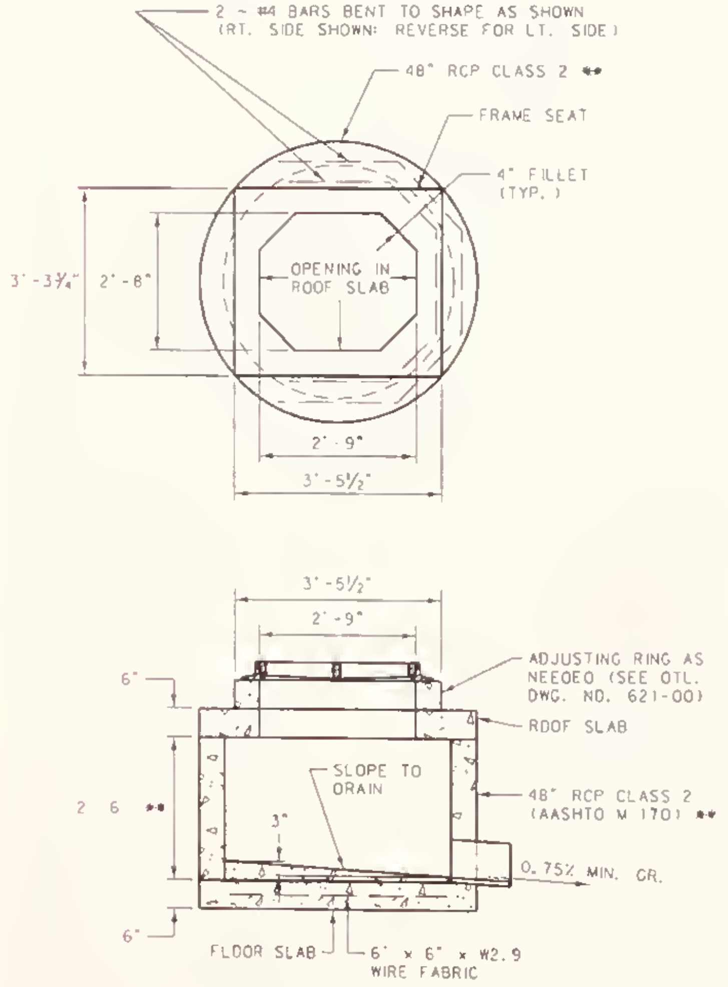
SECTION D-D



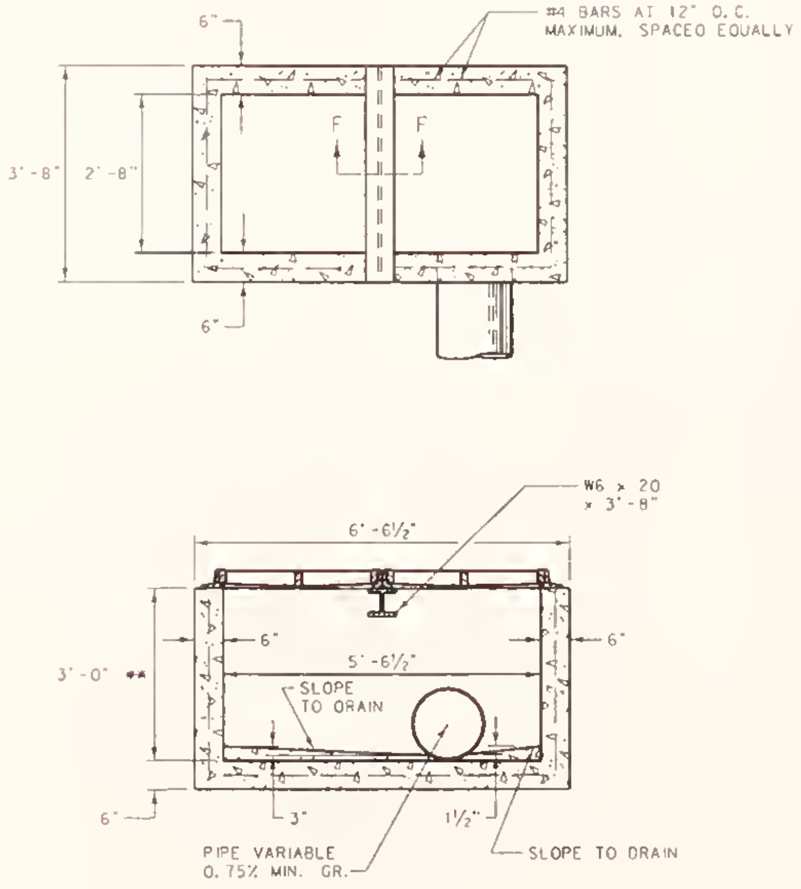
SECTION E-E



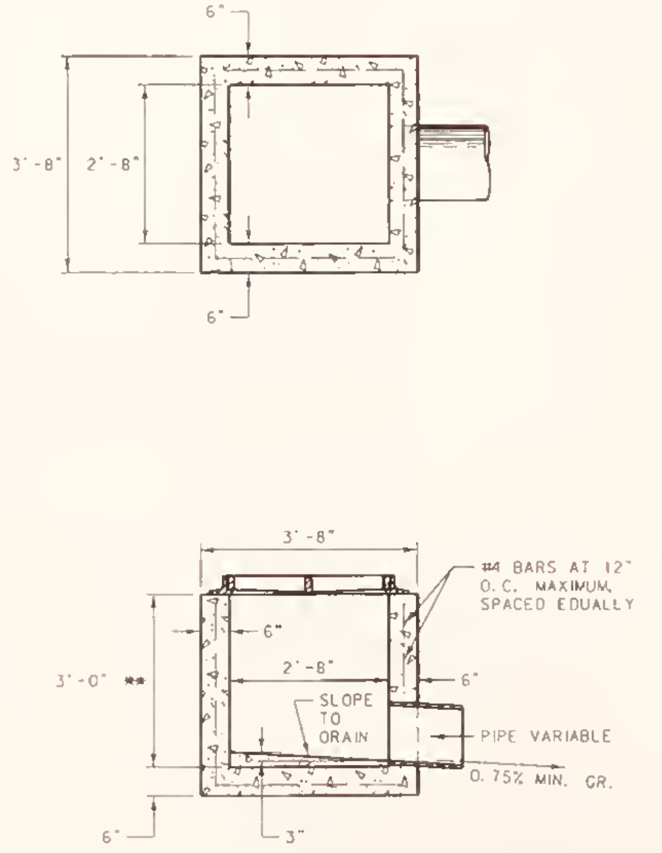
SECTION F-F
(FOR DOUBLE INLET)


2 ~ #4 BARS BENT TO SHAPE AS SHOWN (RT. SIDE SHOWN: REVERSE FOR LT. SIDE)
48" RCP CLASS 2 **
FRAME SEAT
4" FILLET (TYP.)
OPENING IN ROOF SLAB
3'-3¾"
2'-8"
2'-9"
3'-5½"
ADJUSTING RING AS NEEDED (SEE DTL. DWG. NO. 621-00)
ROOF SLAB
SLOPE TO DRAIN
48" RCP CLASS 2 (AASHTO M 170) **
0.75% MIN. GR.
FLOOR SLAB
6" × 6" × W2.9 WIRE FABRIC
6"
3"
2'-6" **

ROUND, SINGLE DROP INLET
TYPE I


#4 BARS AT 12" O.C. MAXIMUM, SPACED EQUALLY
6"
3'-8"
2'-8"
F
W6 × 20 × 3'-8"
6'-6½"
5'-6½"
3'-0" **
SLOPE TO DRAIN
PIPE VARIABLE 0.75% MIN. GR.
3"
1½"

DOUBLE DROP INLET
TYPE II



SINGLE DROP INLET
TYPE III

QUANTITIES *		
	CONCRETE	REINF. STL.
TYPE I	0.45 C.Y.	40 LB.
TYPE II	1.5 C.Y.	145 LB.
TYPE III	1.0 C.Y.	90 LB.

* FOR ESTIMATING PURPOSES ONLY

NOTES:

ALL CONCRETE IS CLASS "DD" OR APPROVED EQUAL.

SEE PLANS FOR DETAILS AND QUANTITIES.

PLACE THE GRATE SO THE FIRST BAR IS A MAXIMUM OF 12 INCHES FROM THE BACK OF THE CURB.

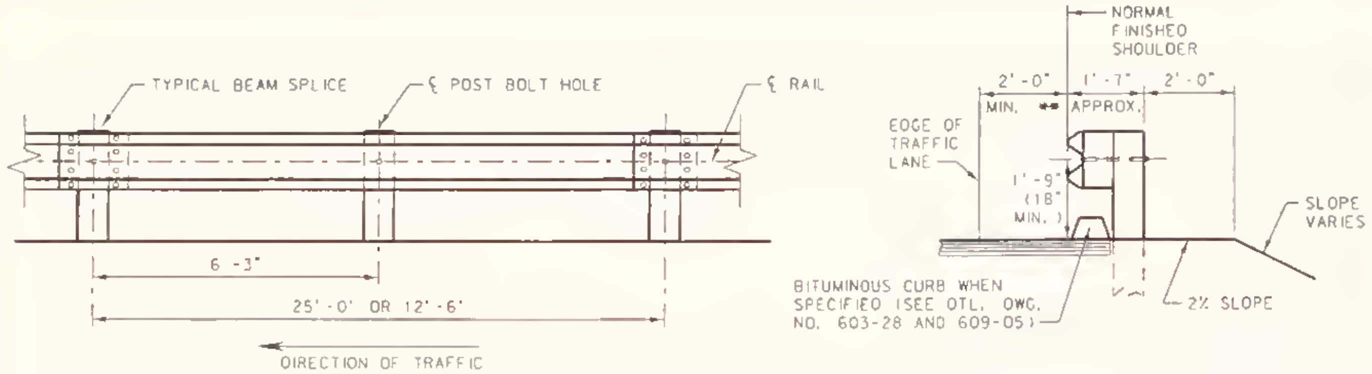
** STANDARD UNLESS OTHERWISE NOTED ON PLANS.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 604
DWG. NO.
604-14

DROP INLETS

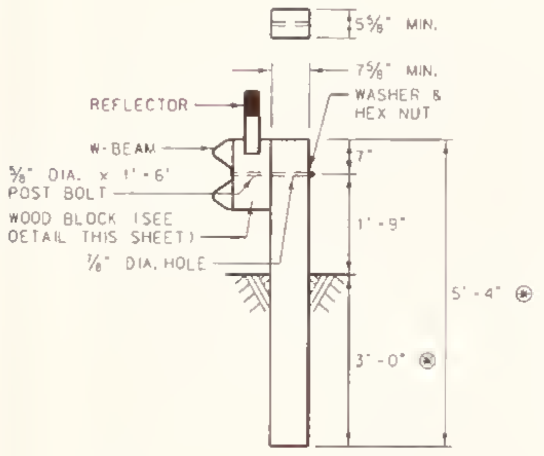
EFFECTIVE: AUGUST 1999

MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



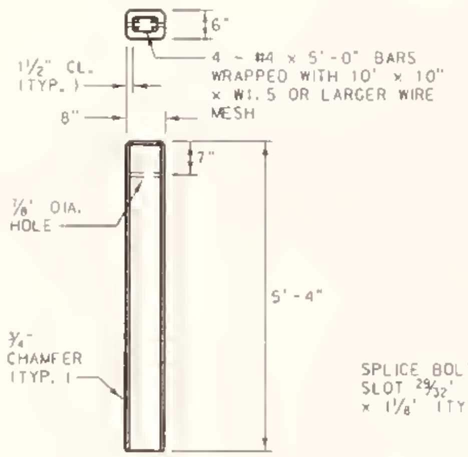
** WIDENING IS REQUIRED IF FINISHED SHOULDER IS LESS THAN 2'-0" FROM TRAFFIC LANE.

TYPICAL INSTALLATION

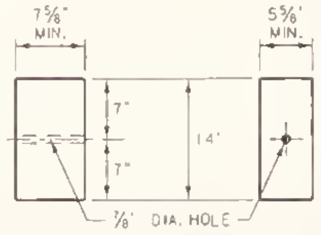


WOOD POST AND MOUNTING DETAIL

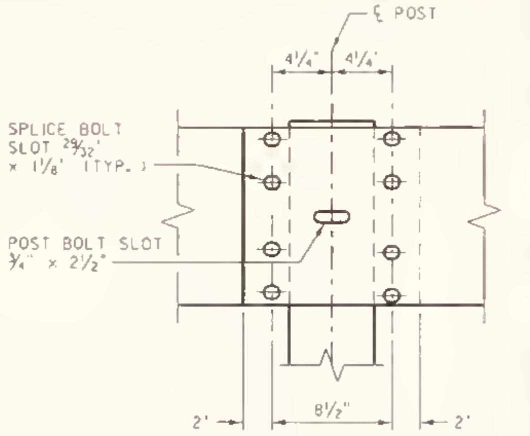
⊛ STANDARD UNLESS SPECIFIED OTHERWISE IN PLANS.


6"
1½" CL. (TYP.)
8"
4 ~ #4 × 5'-0" BARS WRAPPED WITH 10" × 10" × W1.5 OR LARGER WIRE MESH
7"
⅞" DIA. HOLE
5'-4"
¾" CHAMFER (TYP.)

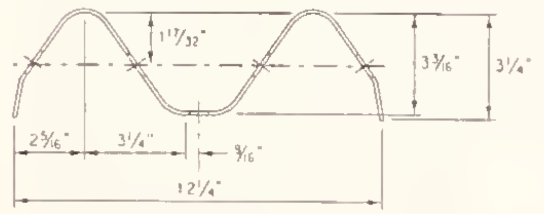
CONCRETE POST DETAIL



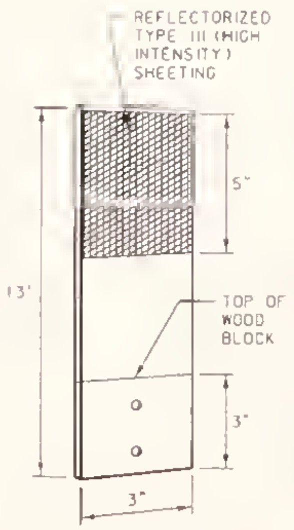
WOOD BLOCK



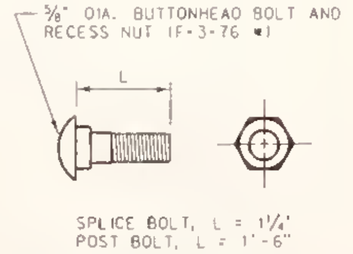
BEAM SPLICE
(LAP IN DIRECTION OF ADJACENT TRAFFIC)



W-BEAM
RE-3-73 ♦



REFLECTOR
(SEE NOTES)



SPLICE BOLT, L = 1¼"
POST BOLT, L = 1'-6"

SPLICE AND POST BOLT & NUT

NOTES:

INSTALL ALL BOLTS WITH HEADS ON TRAFFIC SIDE OF INSTALLATION.

AFFIX BLOCKS TO POSTS WITH CONSTRUCTION ADHESIVE OR TWO 16 PENNY GALV. NAILS OR 14 GAGE WIRE WRAP.

ATTACH REFLECTORS TO WOOD BLOCKS EVERY 25 FEET, WITH THE REFLECTORIZED SURFACE FACING ADJACENT TRAFFIC. FASTEN REFLECTOR TO BLOCK USING TWO 16 PENNY GALVANIZED NAILS AND TWO 3/16" DIA. WASHERS IN PRE-DRILLED HOLES.

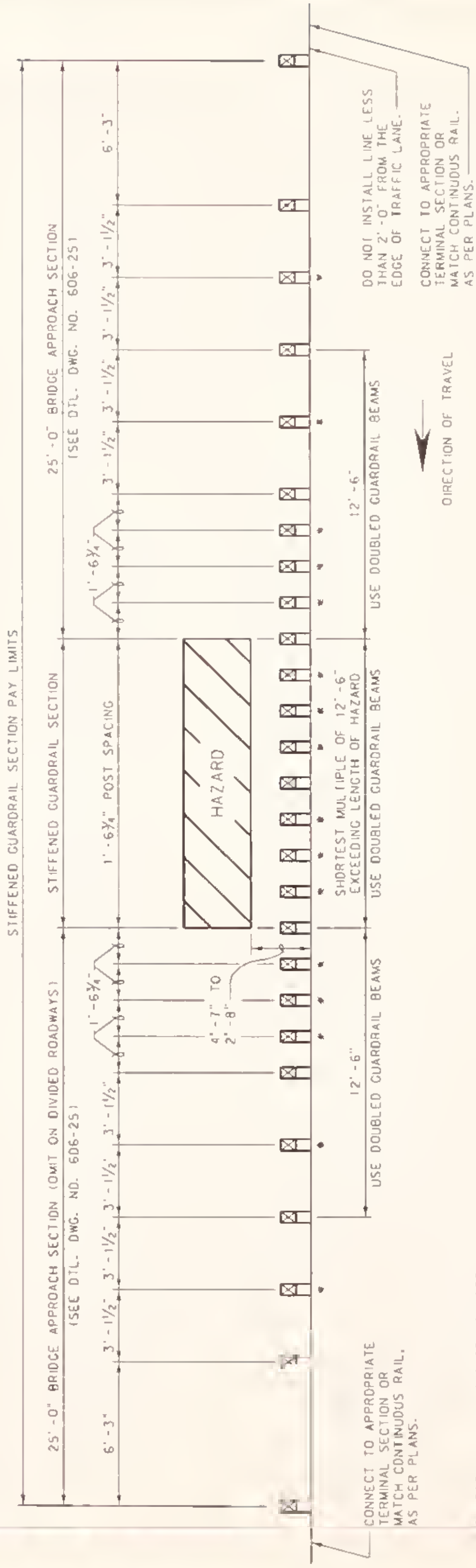
♦ SEE DTL. DWG. NO. 606-80 FOR SCHEDULE OF GUARDRAIL HARDWARE.

DETAILED DRAWING
REFERENCE STANDARD SPEC. SECTION 606
DWG. NO. 606-05

METAL GUARDRAIL

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD


STIFFENED GUARDRAIL SECTION PAY LIMITS
25'-0" BRIDGE APPROACH SECTION (SEE DTL. DWG. NO. 606-25)
STIFFENED GUARDRAIL SECTION
25'-0" BRIDGE APPROACH SECTION (OMIT ON DIVIDED ROADWAYS) (SEE DTL. DWG. NO. 606-25)
6'-3"
3'-1½"
1'-6¾"
1'-6¾" POST SPACING
HAZARD
4'-7" TO 2'-8"
12'-6"
USE DOUBLED GUARDRAIL BEAMS
SHORTEST MULTIPLE OF 12'-6" EXCEEDING LENGTH OF HAZARD
DIRECTION OF TRAVEL
DO NOT INSTALL LINE LESS THAN 2'-0" FROM THE EDGE OF TRAFFIC LANE.
CONNECT TO APPROPRIATE TERMINAL SECTION OR MATCH CONTINUOUS RAIL, AS PER PLANS.

LINE HAZARD APPLICATION

♦ GUARDRAIL NOT ATTACHED TO ADDED POSTS. BLOCK-OUT FASTENED TO POST WITH STANDARD POST BOLT.

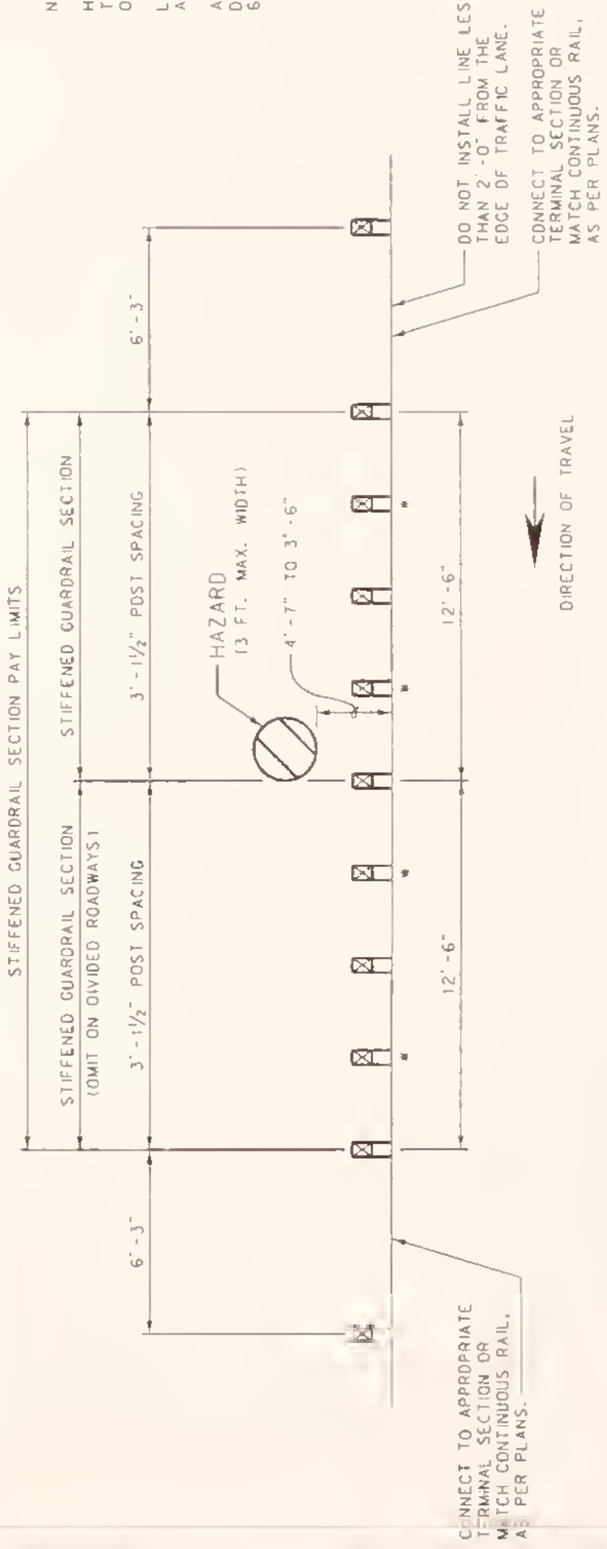
GUARDRAIL ATTACHED TO POSTS ONLY AT STANDARD MULTIPLES OF 6'-3" THROUGH HAZARD SECTION.

NOTES:

HAZARDS CLOSER TO THE INSTALLATION LINE THAN THE INDICATED LIMITS REQUIRE THE USE OF CONCRETE BARRIER RAIL.

LAP ALL DOUBLED RAIL IN THE DIRECTION OF ADJACENT TRAFFIC.

ALL POSTS AND BLOCKS ARE STANDARD DIMENSIONS AS PER DETAILED DRAWING NO. 606-05.


STIFFENED GUARDRAIL SECTION PAY LIMITS
STIFFENED GUARDRAIL SECTION
STIFFENED GUARDRAIL SECTION (OMIT ON DIVIDED ROADWAYS)
3'-1½" POST SPACING
6'-3"
HAZARD (3 FT. MAX. WIDTH)
4'-7" TO 3'-6"
12'-6"
DIRECTION OF TRAVEL
DO NOT INSTALL LINE LESS THAN 2'-0" FROM THE EDGE OF TRAFFIC LANE.
CONNECT TO APPROPRIATE TERMINAL SECTION OR MATCH CONTINUOUS RAIL, AS PER PLANS.

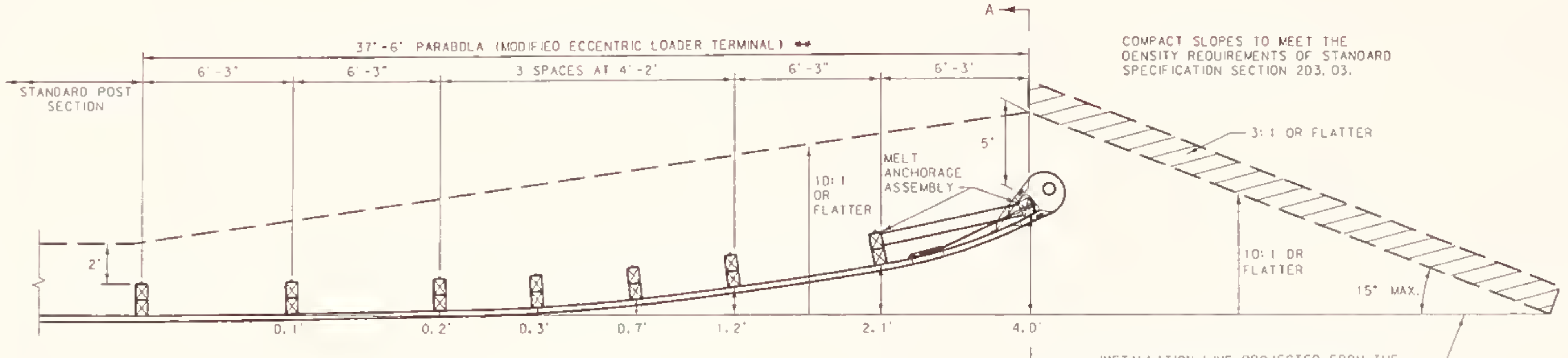
POINT HAZARD APPLICATION

DETAILED DRAWING
REFERENCE STANDARD SPEC. SECTION 606
DWG. NO. 606-07

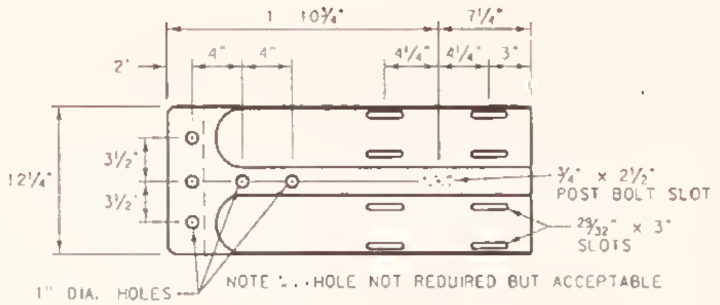
STIFFENED GUARDRAIL SECTIONS

EFFECTIVE: AUGUST 1999

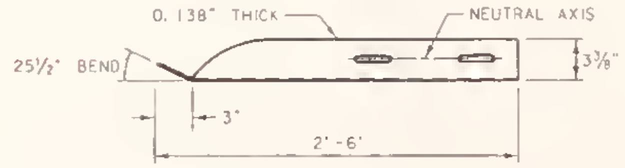
MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD


A
37'-6' PARABOLA (MODIFIED ECCENTRIC LOADER TERMINAL) **
STANDARD POST SECTION
6'-3"
6'-3"
3 SPACES AT 4'-2'
6'-3"
6'-3'
COMPACT SLOPES TO MEET THE DENSITY REQUIREMENTS OF STANDARD SPECIFICATION SECTION 203.03.
3:1 OR FLATTER
5'
MELT ANCHORAGE ASSEMBLY
10:1 OR FLATTER
2'
10:1 OR FLATTER
15° MAX.
0.1'
0.2'
0.3'
0.7'
1.2'
2.1'
4.0'
A
INSTALLATION LINE PROJECTED FROM THE FACE OF THE LAST TWO POST BLOCKS IN THE STANDARD POST SECTION

PLAN

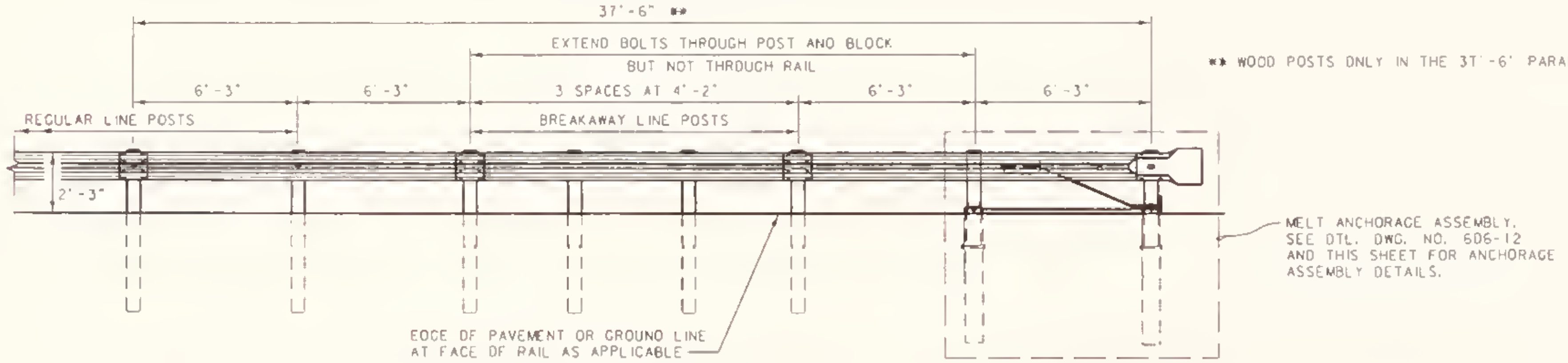


ELEVATION



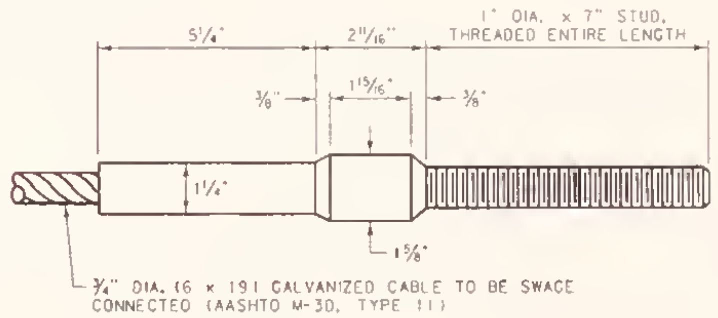
PLAN

TERMINAL CONNECTOR
RE-8-79 *

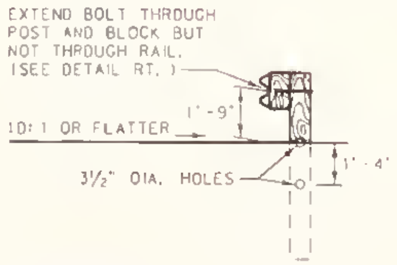

37'-6" **
EXTEND BOLTS THROUGH POST AND BLOCK BUT NOT THROUGH RAIL
6'-3"
6'-3"
3 SPACES AT 4'-2"
6'-3"
6'-3"
REGULAR LINE POSTS
BREAKAWAY LINE POSTS
2'-3"
MELT ANCHORAGE ASSEMBLY. SEE DTL. DWG. NO. 606-12 AND THIS SHEET FOR ANCHORAGE ASSEMBLY DETAILS.
EDGE OF PAVEMENT OR GROUND LINE AT FACE OF RAIL AS APPLICABLE

** WOOD POSTS ONLY IN THE 37'-6' PARABOLA

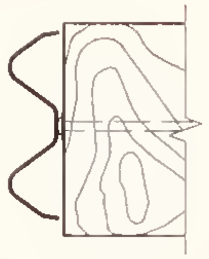
ELEVATION


5¼"
2 11/16"
1" DIA. × 7" STUD, THREADED ENTIRE LENGTH
⅜"
1 15/16"
⅜"
1¼"
1⅝"
¾" DIA. (6 × 19) GALVANIZED CABLE TO BE SWAGE CONNECTED (AASHTO M-30, TYPE II)

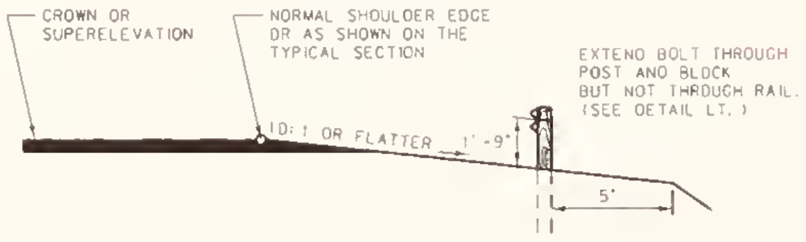
STANDARD SWAGED FITTING AND STUD
CABLE ASSEMBLY
F-37-76 *


EXTEND BOLT THROUGH POST AND BLOCK BUT NOT THROUGH RAIL. (SEE DETAIL RT.)
1'-9"
10:1 OR FLATTER
3½" DIA. HOLES
1'-4"

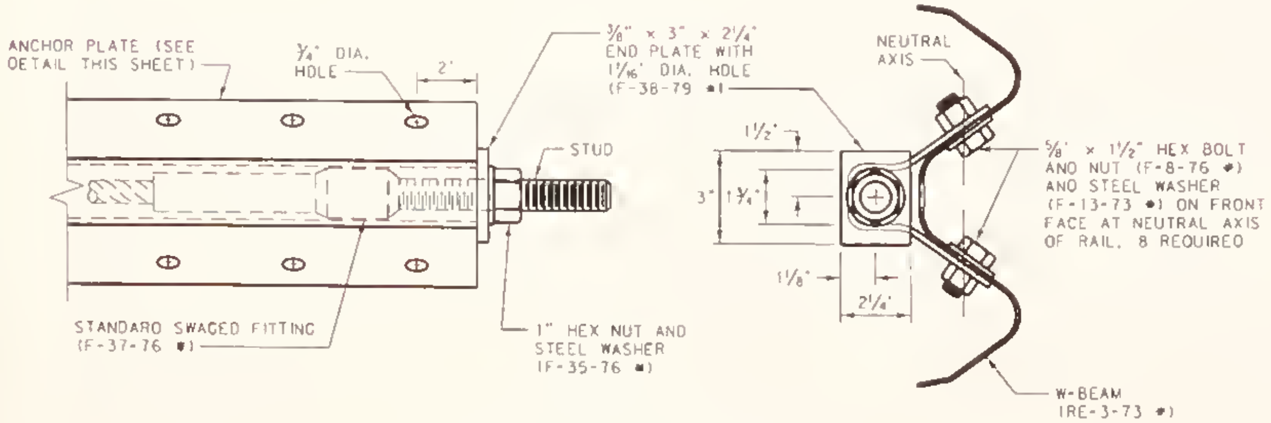
BREAKAWAY LINE POST AND BLOCK
(MODIFIED ARTBA P-11-79)



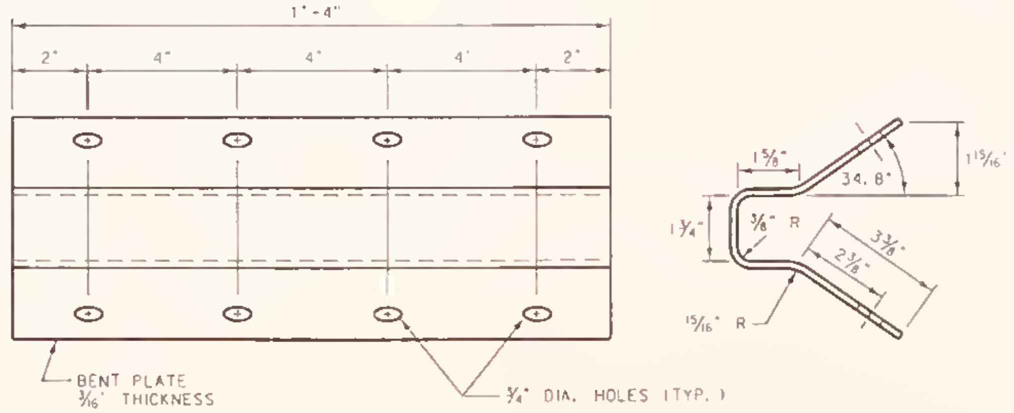
DETAIL


CROWN OR SUPERELEVATION
NORMAL SHOULDER EDGE OR AS SHOWN ON THE TYPICAL SECTION
EXTEND BOLT THROUGH POST AND BLOCK BUT NOT THROUGH RAIL. (SEE DETAIL LT.)
10:1 OR FLATTER
1'-9"
5'

SECTION A-A


ANCHOR PLATE (SEE DETAIL THIS SHEET)
¾" DIA. HOLE
2'
⅜" × 3" × 2¼" END PLATE WITH 1 1/16" DIA. HOLE (F-38-79 *)
STUD
STANDARD SWAGED FITTING (F-37-76 *)
1" HEX NUT AND STEEL WASHER (F-35-76 *)
NEUTRAL AXIS
1½"
3"
1¾"
1⅛"
2¼"
⅝" × 1½" HEX BOLT AND NUT (F-8-76 *) AND STEEL WASHER (F-13-73 *) ON FRONT FACE AT NEUTRAL AXIS OF RAIL, 8 REQUIRED
W-BEAM (RE-3-73 *)

ANCHOR PLATE ASSEMBLY DETAILS



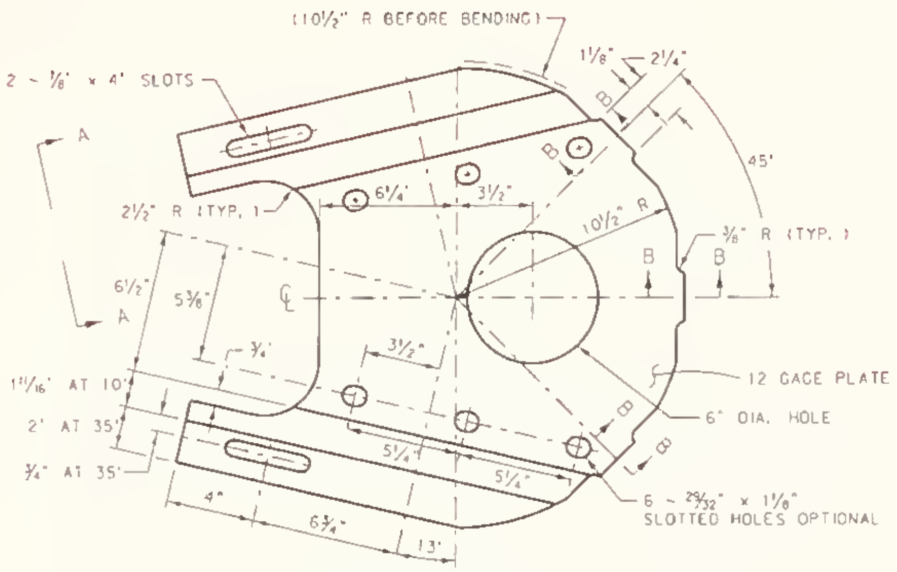
ANCHOR PLATE
RE-71-79 *

NOTE:
* SEE DTL. DWG. NO. 606-80 FOR SCHEDULE OF GUARDRAIL HARDWARE.

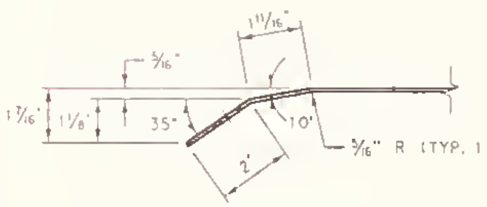
DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 606
DWG. NO.
606-11

MODIFIED ECCENTRIC
LOADER TERMINAL
(MELT) ASSEMBLY

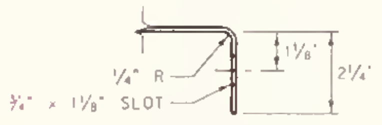
EFFECTIVE: AUGUST 1999
MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



DIAPHRAGM PLATE DETAIL
(2 REQUIRED EACH TERMINAL)

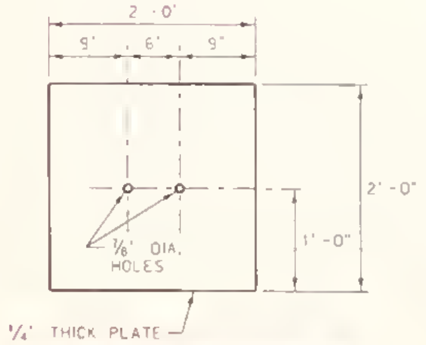


SECTION A-A

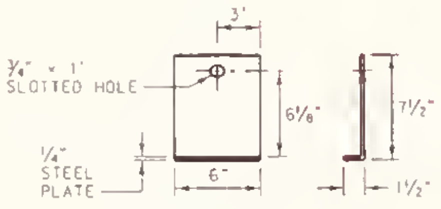


SECTION B-B

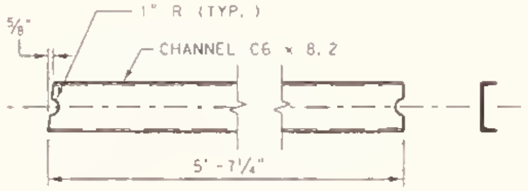
DIAPHRAGM PLATE DETAIL



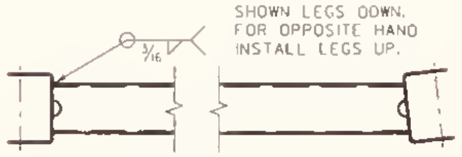
SOIL PLATE (2 REQUIRED)



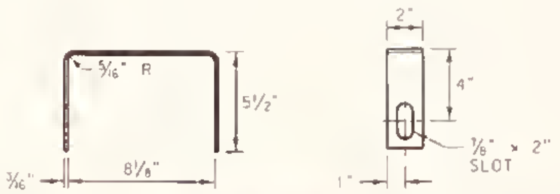
DETAIL "C"
SHELF ANGLE



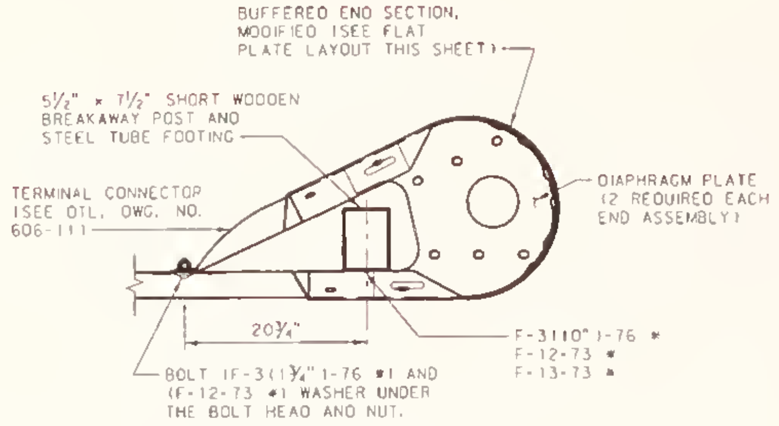
STRUT DETAILS



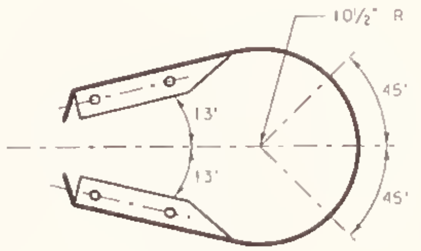
STRUT AND YOKE ASSEMBLY



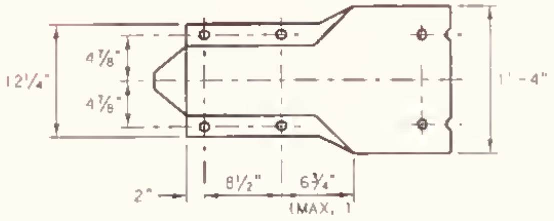
YOKE DETAILS


BUFFERED END SECTION, MODIFIED (SEE FLAT PLATE LAYOUT THIS SHEET)
5½" × 7½" SHORT WOODEN BREAKAWAY POST AND STEEL TUBE FOOTING
TERMINAL CONNECTOR (SEE DTL. DWG. NO. 606-11)
DIAPHRAGM PLATE (2 REQUIRED EACH END ASSEMBLY)
20¾"
F-3(10")-76 *
F-12-73 *
F-13-73 *
BOLT (F-3(1¾")-76 *) AND (F-12-73 *) WASHER UNDER THE BOLT HEAD AND NUT.

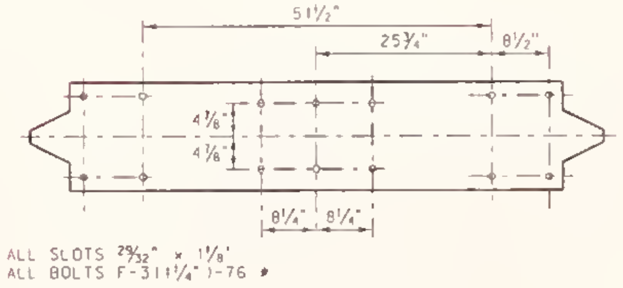
BUFFERED END SECTION ASSEMBLY



PLAN

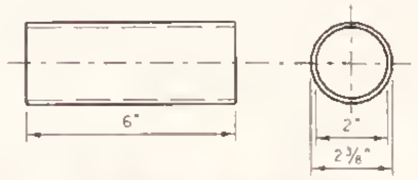


ELEVATION

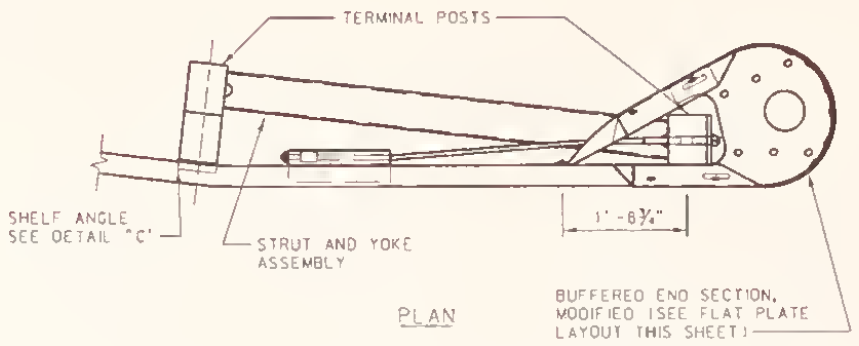


FLAT PLATE LAYOUT

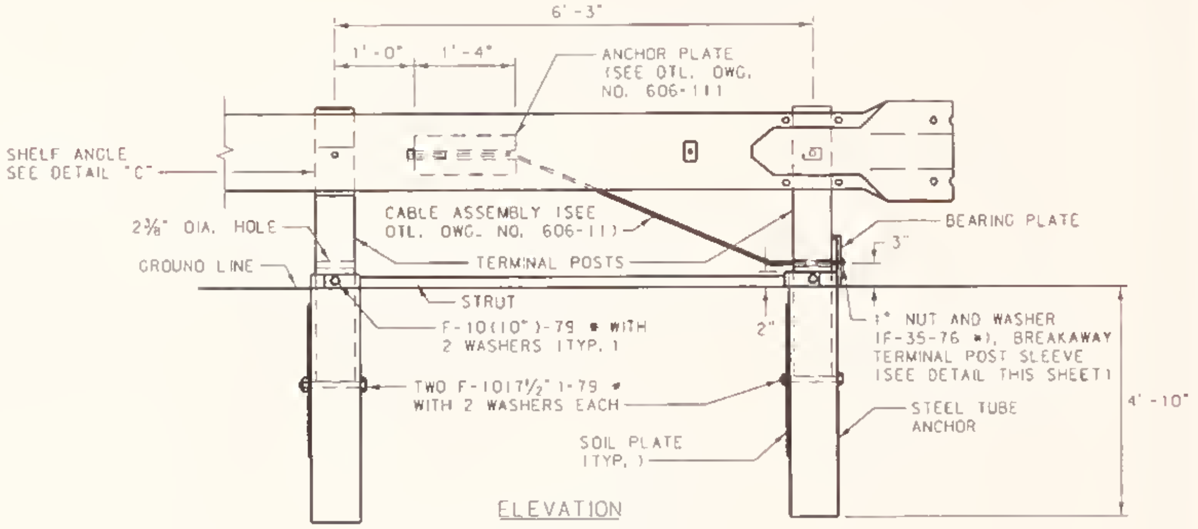
BUFFERED END SECTION
(MODIFIED RE-7-79 *)



BREAKAWAY TERMINAL POST SLEEVE
F-34-76 *

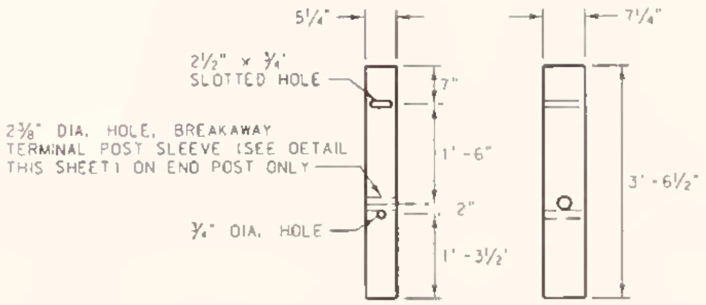

TERMINAL POSTS
SHELF ANGLE SEE DETAIL "C"
STRUT AND YOKE ASSEMBLY
1'-6¾"
BUFFERED END SECTION, MODIFIED (SEE FLAT PLATE LAYOUT THIS SHEET)

PLAN

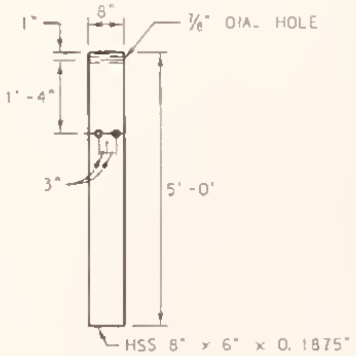

6'-3"
1'-0"
1'-4"
ANCHOR PLATE (SEE DTL. DWG. NO. 606-11)
SHELF ANGLE SEE DETAIL "C"
2⅜" DIA. HOLE
GROUND LINE
CABLE ASSEMBLY (SEE DTL. DWG. NO. 606-11)
TERMINAL POSTS
BEARING PLATE
3"
STRUT
F-10(10")-79 * WITH 2 WASHERS (TYP.)
2"
1" NUT AND WASHER (F-35-76 *), BREAKAWAY TERMINAL POST SLEEVE (SEE DETAIL THIS SHEET)
TWO F-10(7½")-79 * WITH 2 WASHERS EACH
STEEL TUBE ANCHOR
SOIL PLATE (TYP.)
4'-10"

ELEVATION

ANCHORAGE ASSEMBLY

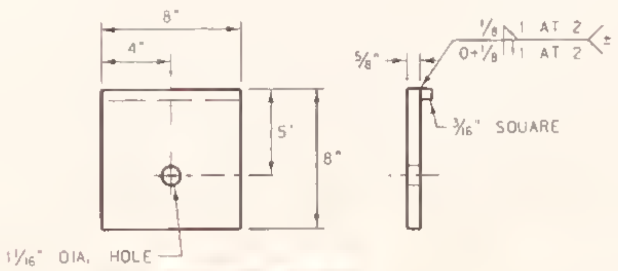

5¼"
7¼"
2½" × ¾" SLOTTED HOLE
7"
2⅜" DIA. HOLE, BREAKAWAY TERMINAL POST SLEEVE (SEE DETAIL THIS SHEET) ON END POST ONLY
1'-6"
2"
¾" DIA. HOLE
1'-3½"
3'-6½"

TERMINAL POST



STEEL TUBE ANCHOR

NOTE:
* SEE DTL. DWG. NO. 606-80 FOR SCHEDULE OF GUARDRAIL HARDWARE



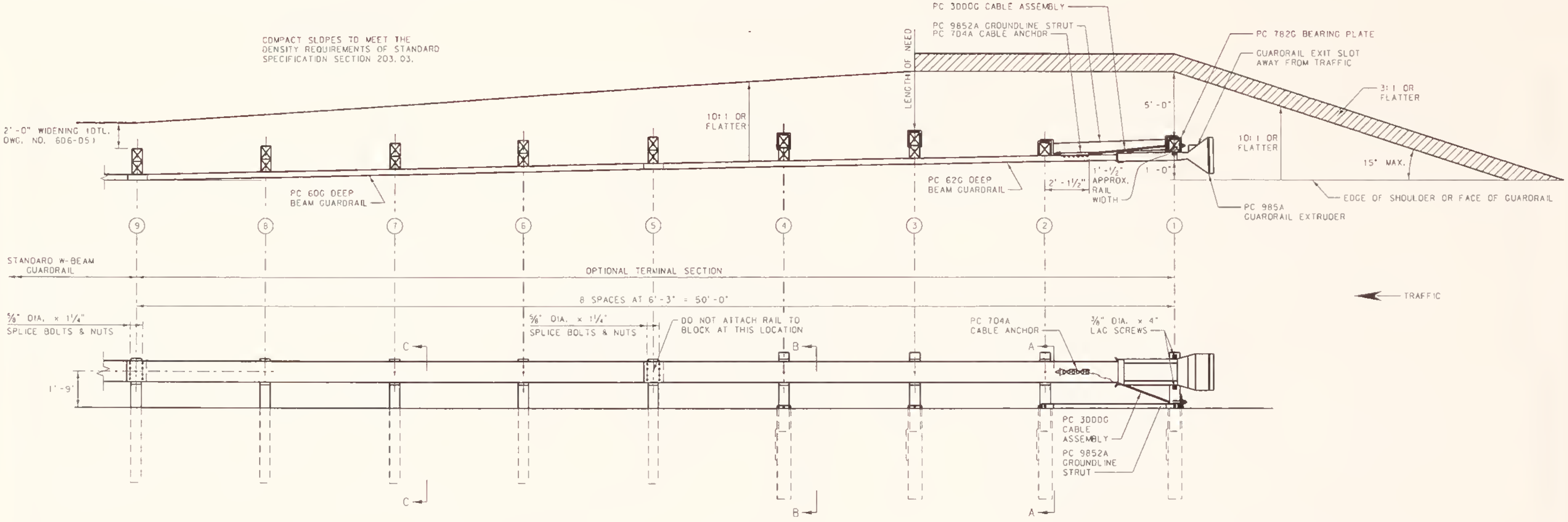
BEARING PLATE

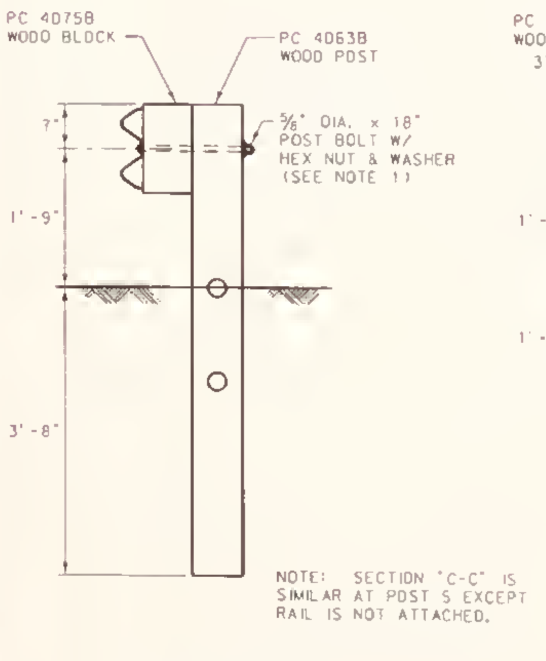
DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 606
DWG. NO.
606-12

MODIFIED ECCENTRIC
LOADER TERMINAL
(MELT) DETAILS

EFFECTIVE: AUGUST 1999

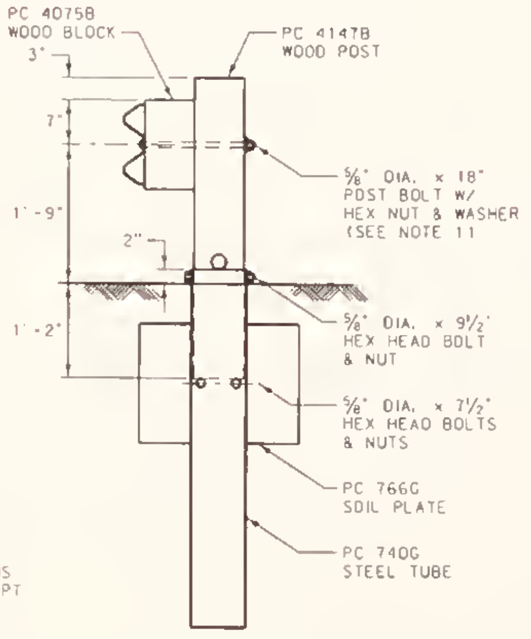
MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD


COMPACT SLOPES TO MEET THE DENSITY REQUIREMENTS OF STANDARD SPECIFICATION SECTION 203.03.
PC 3000G CABLE ASSEMBLY
PC 9852A GROUNDLINE STRUT
PC 704A CABLE ANCHOR
PC 782G BEARING PLATE
GUARDRAIL EXIT SLOT AWAY FROM TRAFFIC
3:1 OR FLATTER
LENGTH OF NEED
5'-0"
10:1 OR FLATTER
10:1 OR FLATTER
15° MAX.
2'-0" WIDENING (DTL. DWG. NO. 606-05)
PC 606 DEEP BEAM GUARDRAIL
PC 626 DEEP BEAM GUARDRAIL
2'-1½"
1'-½" APPROX. RAIL WIDTH
1'-0"
PC 985A GUARDRAIL EXTRUDER
EDGE OF SHOULDER OR FACE OF GUARDRAIL
9
8
7
6
5
4
3
2
1
STANDARD W-BEAM GUARDRAIL
OPTIONAL TERMINAL SECTION
8 SPACES AT 6'-3" = 50'-0"
TRAFFIC
⅝" DIA. × 1¼" SPLICE BOLTS & NUTS
⅝" DIA. × 1¼" SPLICE BOLTS & NUTS
DO NOT ATTACH RAIL TO BLOCK AT THIS LOCATION
PC 704A CABLE ANCHOR
⅜" DIA. × 4" LAG SCREWS
C
B
A
1'-9"
PC 3000G CABLE ASSEMBLY
PC 9852A GROUNDLINE STRUT
C
B
A

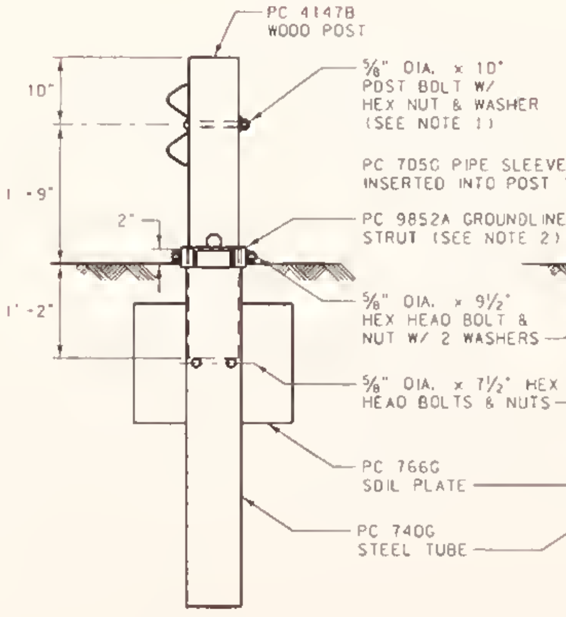


NOTE: SECTION "C-C" IS SIMILAR AT POST 5 EXCEPT RAIL IS NOT ATTACHED.

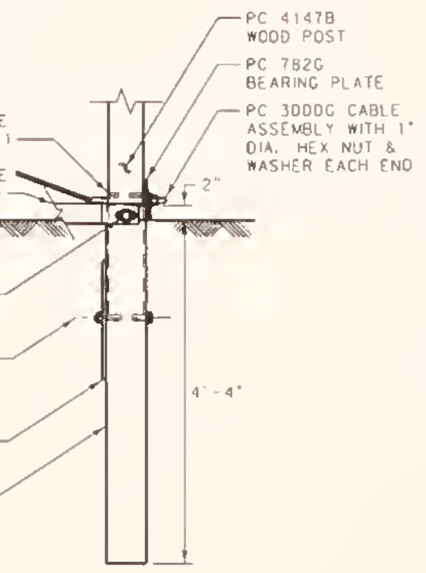
SECTION "C-C"
(TYP. AT POSTS 6, 7 AND 8)


PC 4075B WOOD BLOCK
3"
PC 4147B WOOD POST
7"
⅝" DIA. × 18" POST BOLT W/ HEX NUT & WASHER (SEE NOTE 1)
1'-9"
2"
⅝" DIA. × 9½" HEX HEAD BOLT & NUT
1'-2"
⅝" DIA. × 7½" HEX HEAD BOLTS & NUTS
PC 766G SOIL PLATE
PC 740G STEEL TUBE

SECTION "B-B"
(TYP. AT POSTS 3 AND 4)


PC 4147B WOOD POST
10"
⅝" DIA. × 10" POST BOLT W/ HEX NUT & WASHER (SEE NOTE 1)
1'-9"
2"
⅝" DIA. × 9½" HEX HEAD BOLT & NUT W/ 2 WASHERS
1'-2"
⅝" DIA. × 7½" HEX HEAD BOLTS & NUTS
PC 766G SOIL PLATE
PC 740G STEEL TUBE

SECTION "A-A"
(AT POST 2)


PC 705G PIPE SLEEVE INSERTED INTO POST 1
PC 9852A GROUNDLINE STRUT (SEE NOTE 2)
PC 4147B WOOD POST
PC 782G BEARING PLATE
PC 3000G CABLE ASSEMBLY WITH 1" DIA. HEX NUT & WASHER EACH END
2"
4'-4"

PARTIAL VIEW AT POST 1
(DO NOT ATTACH RAIL TO POST 1)

BILL OF MATERIAL

PC	QTY	DESCRIPTION
606	1	DEEP BEAM G.R. (12 GA.), 25'-0"
626	1	DEEP BEAM G.R. (12 GA.), 25'-0"
704A	1	CABLE ANCHOR
705G	1	PIPE SLEEVE, 2" DIA. × 5½"
740G	4	STEEL TUBE, 6" × 8" × 4'-6"
766G	4	SOIL PLATE, 18" × 24" × ¼"
782G	1	BEARING PLATE, 8" × 8" × ⅝"
985A	1	GUARDRAIL EXTRUDER
3000G	1	CABLE ASSEMBLY
3300G	11	⅝" DIA. WASHER
3340G	35	⅝" DIA. NUT
3360G	16	⅝" DIA. × 1¼" SPLICE BOLT
3478G	8	⅝" DIA. × 7½" HEX HEAD BOLT
3497G	4	⅝" DIA. × 9½" HEX HEAD BOLT
3500G	1	⅝" DIA. × 10" POST BOLT
3580G	6	⅝" DIA. × 18" POST BOLT
3900G	2	1" DIA. WASHER
3910G	2	1" DIA. HEX NUT
4063B	4	WOOD POST, 6" × 8" × 6'-0"
4075B	6	WOOD BLOCK, 6" × 8" × 1'-2"
4147B	4	WOOD POST, 5½" × 7½" × 3'-9"
4228G	2	⅜" DIA. × 4" LAG SCREW
9852A	1	GROUNDLINE STRUT (LEFT OR RIGHT)

NOTES:

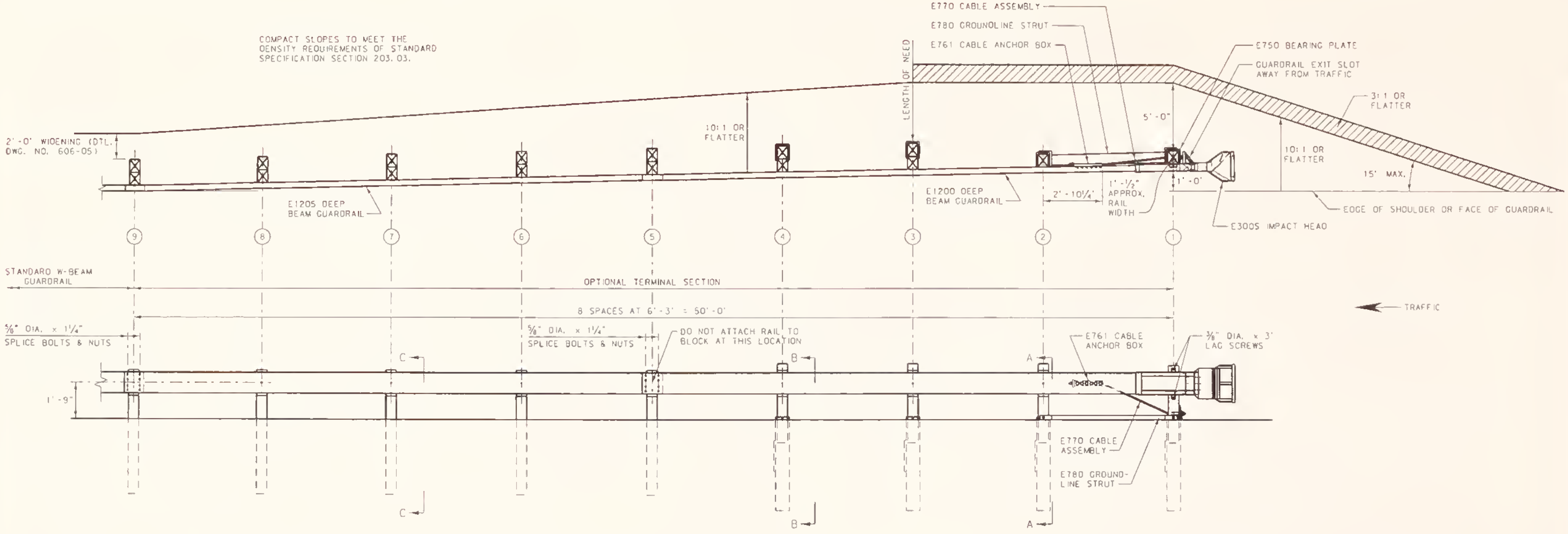
1. THE ⅝" DIA. FLAT WASHER IS USED UNDER THE NUT, BEHIND THE POST ONLY. NO WASHER IS USED AT THE RAIL.
2. STRUT CHANNEL IS SHOWN LEGS DOWN. FOR OPPOSITE HAND INSTALL LEGS UP.
3. USE THE ET-2000 TERMINAL SECTION ON DIVIDED ROADWAYS IF THE WIDTH IS 25' OR GREATER BETWEEN FINISHED SURFACES. CONSIDER OTHER TERMINAL SECTIONS IF THE WIDTH IS LESS THAN 25 FEET BETWEEN FINISHED SURFACES.
4. FLARE THE END SECTION AWAY FROM TRAFFIC AT A RATE OF 50:1 FOR 50' (ILLUSTRATED). FLARES OF 50:1 FOR 100' MAY ALSO BE USED. THE FLARE MAY BE OMITTED ON ROADS WITH SHOULDERS GREATER THAN 2' IN WIDTH.
5. PLACE A SELF-ADHESIVE OBJECT MARKER ON THE GUARDRAIL EXTRUDER FACE, HAVING ALTERNATING RETRO-REFLECTIVE BLACK AND YELLOW STRIPES SLOPED DOWNWARD AT AN ANGLE OF 45° TOWARDS THE SIDE ON WHICH TRAFFIC IS TO PASS.

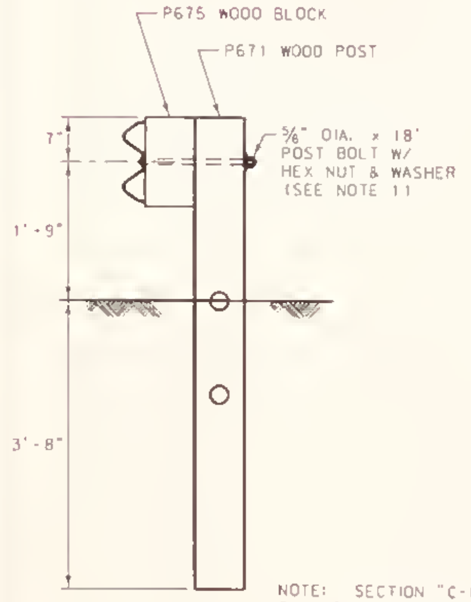
DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 606
DWG. NO.
606-13A

OPTIONAL
TERMINAL SECTION -
ET-2000

EFFECTIVE: AUGUST 1999

MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

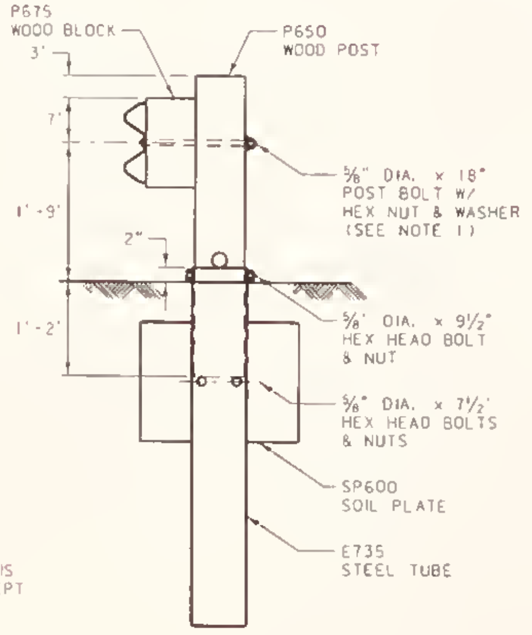

COMPACT SLOPES TO MEET THE DENSITY REQUIREMENTS OF STANDARD SPECIFICATION SECTION 203.03.
E770 CABLE ASSEMBLY
E780 GROUNDLINE STRUT
E761 CABLE ANCHOR BOX
E750 BEARING PLATE
GUARDRAIL EXIT SLOT AWAY FROM TRAFFIC
3:1 OR FLATTER
LENGTH OF NEED
5'-0"
10:1 OR FLATTER
10:1 OR FLATTER
15' MAX.
2'-0" WIDENING (DTL. DWG. NO. 606-05)
E1205 DEEP BEAM GUARDRAIL
E1200 DEEP BEAM GUARDRAIL
2'-10¼"
1'-½" APPROX. RAIL WIDTH
1'-0"
E3005 IMPACT HEAD
EDGE OF SHOULDER OR FACE OF GUARDRAIL
9
8
7
6
5
4
3
2
1
STANDARD W-BEAM GUARDRAIL
OPTIONAL TERMINAL SECTION
8 SPACES AT 6'-3" = 50'-0"
TRAFFIC
⅝" DIA. x 1¼" SPLICE BOLTS & NUTS
⅝" DIA. x 1¼" SPLICE BOLTS & NUTS
DO NOT ATTACH RAIL TO BLOCK AT THIS LOCATION
E761 CABLE ANCHOR BOX
⅜" DIA. x 3" LAG SCREWS
C
B
A
1'-9"
E770 CABLE ASSEMBLY
E780 GROUND-LINE STRUT
C
B
A



NOTE: SECTION "C-C" IS SIMILAR AT POST 5 EXCEPT RAIL IS NOT ATTACHED.

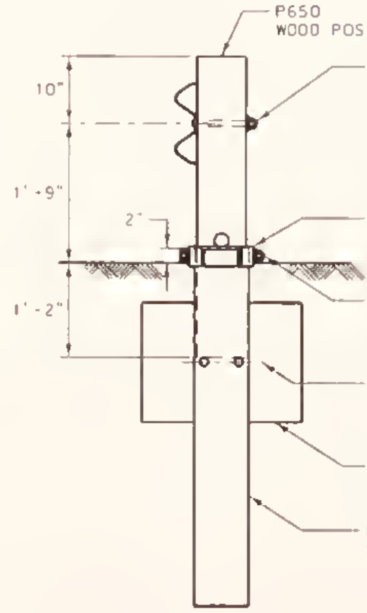
SECTION "C-C"

(TYP. AT POSTS 6, 7 AND 8)


P675 WOOD BLOCK
3"
P650 WOOD POST
7"
⅝" DIA. x 18" POST BOLT W/ HEX NUT & WASHER (SEE NOTE 1)
1'-9"
2"
⅝" DIA. x 9½" HEX HEAD BOLT & NUT
1'-2"
⅝" DIA. x 7½" HEX HEAD BOLTS & NUTS
SP600 SOIL PLATE
E735 STEEL TUBE

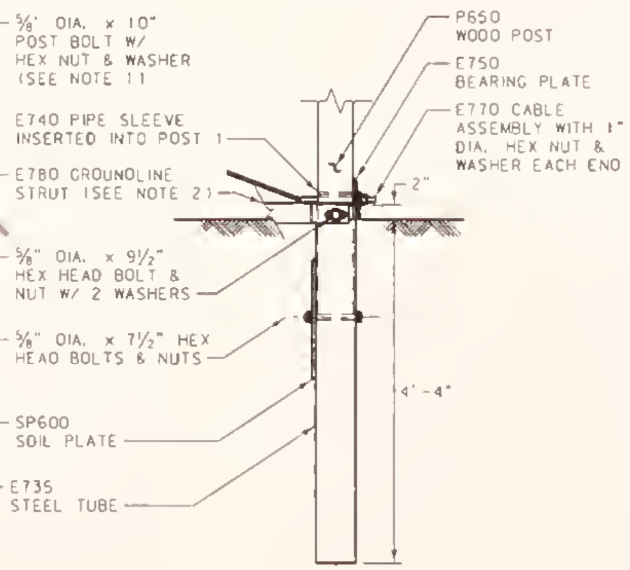
SECTION "B-B"

(TYP. AT POSTS 3 AND 4)


P650 WOOD POST
10"
⅝" DIA. x 10" POST BOLT W/ HEX NUT & WASHER (SEE NOTE 1)
1'-9"
2"
E780 GROUNDLINE STRUT (SEE NOTE 2)
1'-2"
⅝" DIA. x 9½" HEX HEAD BOLT & NUT W/ 2 WASHERS
⅝" DIA. x 7½" HEX HEAD BOLTS & NUTS
SP600 SOIL PLATE
E735 STEEL TUBE

SECTION "A-A"

(AT POST 2)


E740 PIPE SLEEVE INSERTED INTO POST 1
P650 WOOD POST
E750 BEARING PLATE
E770 CABLE ASSEMBLY WITH 1" DIA. HEX NUT & WASHER EACH END
2"
4'-4"

PARTIAL VIEW AT POST 1

(DO NOT ATTACH RAIL TO POST 1)

BILL OF MATERIAL		
CODE	QTY	DESCRIPTION
E1200	1	DEEP BEAM G.R. (12 GA.), 26'-6½"
E1205	1	DEEP BEAM G.R. (12 GA.), 26'-½"
E735	4	STEEL TUBE, 6" x 8" x 4'-6"
SP600	4	SOIL PLATE, 18" x 24" x ¼"
E740	1	PIPE SLEEVE, 2" DIA. x 5½"
E750	1	BEARING PLATE, 8" x 8" x ⅝"
E761	1	CABLE ANCHOR BOX
E770	1	CABLE ASSEMBLY
E780	1	GROUNDLINE STRUT (LEFT OR RIGHT)
E3005	1	BEST IMPACT HEAD
P650	4	WOOD POST, 5½" x 7½" x 3'-9"
P671	4	WOOD CRT POST, 6" x 8" x 6'-0"
P675	6	WOOD BLOCK, 6" x 8" x 1'-2"
B580122	16	⅝" DIA. x 1¼" SPLICE BOLT
B580754	8	⅝" DIA. x 7½" HEX HEAD BOLT
B580954	4	⅝" DIA. x 9½" HEX HEAD BOLT
B581002	1	⅝" DIA. x 10" POST BOLT
B581802	6	⅝" DIA. x 18" POST BOLT
E350	2	⅜" DIA. x 3" LAG SCREW
N050	35	⅝" DIA. NUT
W050	11	⅝" DIA. FLAT WASHER
N100	2	1" DIA. HEX NUT
W100	2	1" DIA. WASHER

NOTES:

1. THE ⅝" DIA. FLAT WASHER IS USED UNDER THE NUT, BEHIND THE POST ONLY. NO WASHER IS USED AT THE RAIL.
2. STRUT CHANNEL IS SHOWN LEGS DOWN. FOR OPPOSITE HAND INSTALL LEGS UP.
3. USE THE BEST TERMINAL SECTION ON DIVIDED ROADWAYS IF THE WIDTH IS 25' OR GREATER BETWEEN FINISHED SURFACES. CONSIDER OTHER TERMINAL SECTIONS IF THE WIDTH IS LESS THAN 25 FEET BETWEEN FINISHED SURFACES.
4. FLARE THE END SECTION AWAY FROM TRAFFIC AT A RATE OF 50:1 FOR 50' (ILLUSTRATED). FLARES OF 50:1 FOR 100' MAY ALSO BE USED. THE FLARE MAY BE OMITTED ON ROADS WITH SHOULDERS GREATER THAN 2' IN WIDTH.
5. PLACE A SELF-ADHESIVE OBJECT MARKER ON THE GUARDRAIL EXTRUDER FACE, HAVING ALTERNATING RETRO-REFLECTIVE BLACK AND YELLOW STRIPES SLOPED DOWNWARD AT AN ANGLE OF 45° TOWARDS THE SIDE ON WHICH TRAFFIC IS TO PASS.

DETAILED DRAWING

REFERENCE
STANDARD SPEC.
SECTION 606

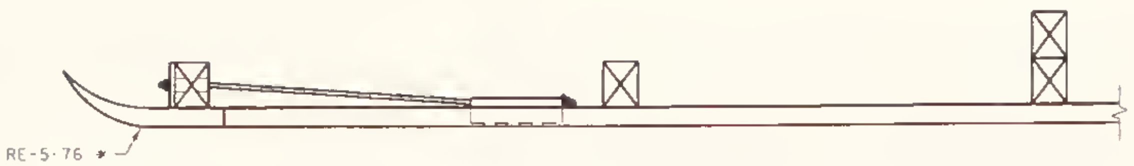
DWG. NO.
606-13B

OPTIONAL
TERMINAL SECTION -
BEST

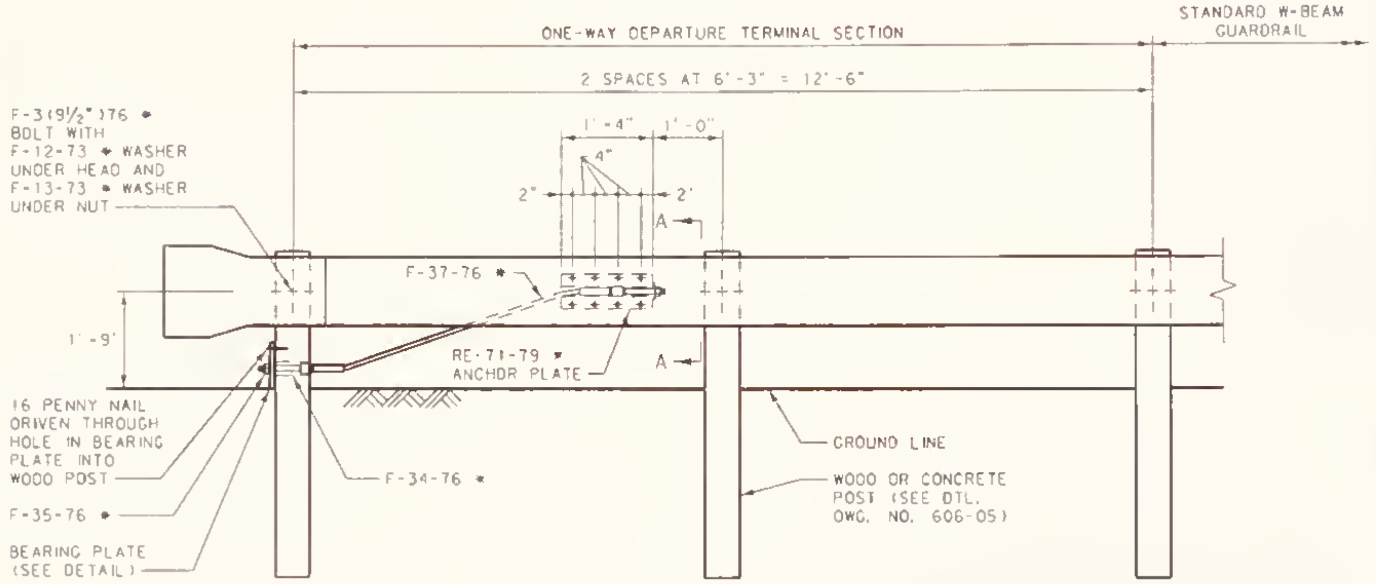
EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION

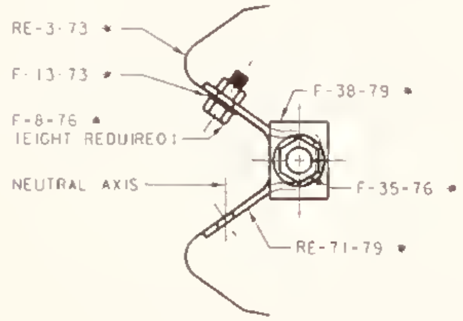
MONTANA CADD



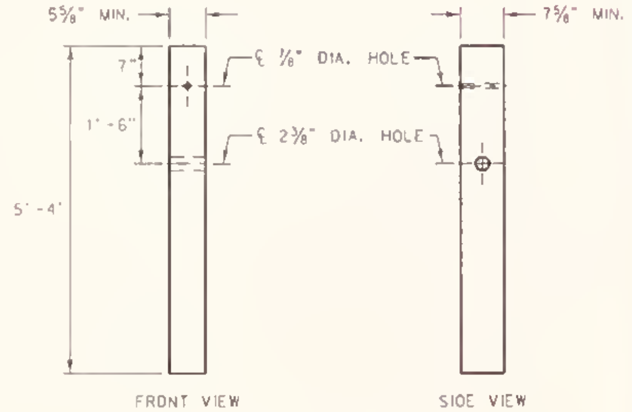
PLAN


ONE-WAY DEPARTURE TERMINAL SECTION
STANDARD W-BEAM GUARDRAIL
2 SPACES AT 6'-3" = 12'-6"
1'-4"
1'-0"
4"
2"
2"
A
A
F-3(9½")76 * BOLT WITH F-12-73 * WASHER UNDER HEAD AND F-13-73 * WASHER UNDER NUT
F-37-76 *
RE-71-79 * ANCHOR PLATE
1'-9"
16 PENNY NAIL DRIVEN THROUGH HOLE IN BEARING PLATE INTO WOOD POST
F-35-76 *
BEARING PLATE (SEE DETAIL)
F-34-76 *
GROUND LINE
WOOD OR CONCRETE POST (SEE DTL. DWG. NO. 606-05)

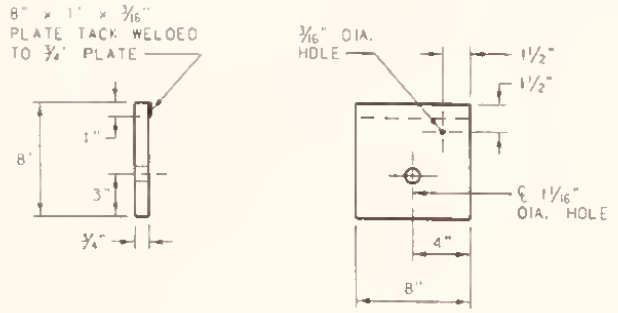
ELEVATION



SECTION A-A



END POST DETAILS



BEARING PLATE DETAIL

NOTE:
* SEE DTL. DWG. NO. 606-80 FOR SCHEDULE OF GUARDRAIL HARDWARE.

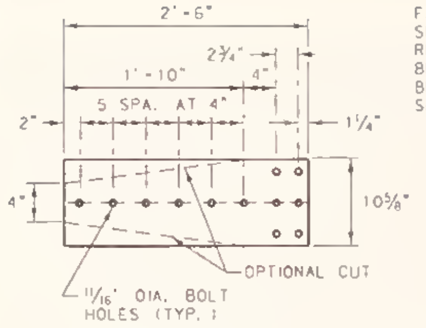
DETAILED DRAWING

REFERENCE STANDARD SPEC. SECTION 606	DWG. NO. 606-18

ONE-WAY DEPARTURE
TERMINAL SECTION

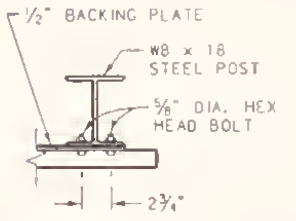
EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

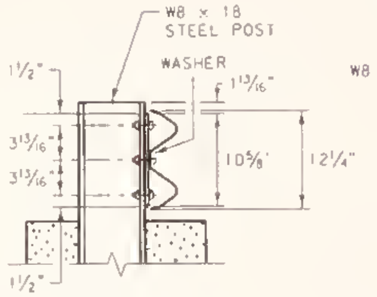


BACKING PLATE

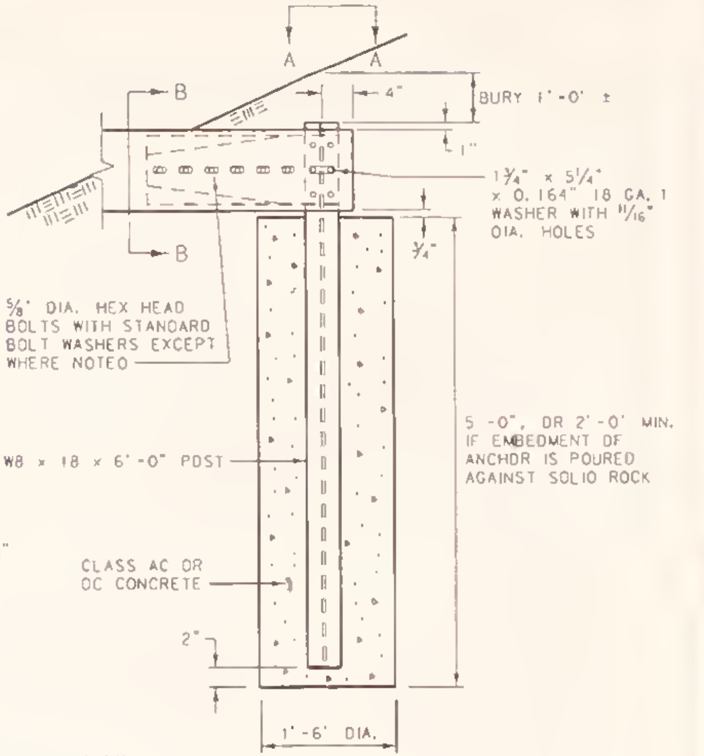
FABRICATE TERMINAL RAIL SECTION AND W8 × 18 TO RECEIVE ⅝" DIA. HEX HEAD BOLTS AS SHOWN. USE BOLTS CONFORMING TO ASTM SPECIFICATION A 325.



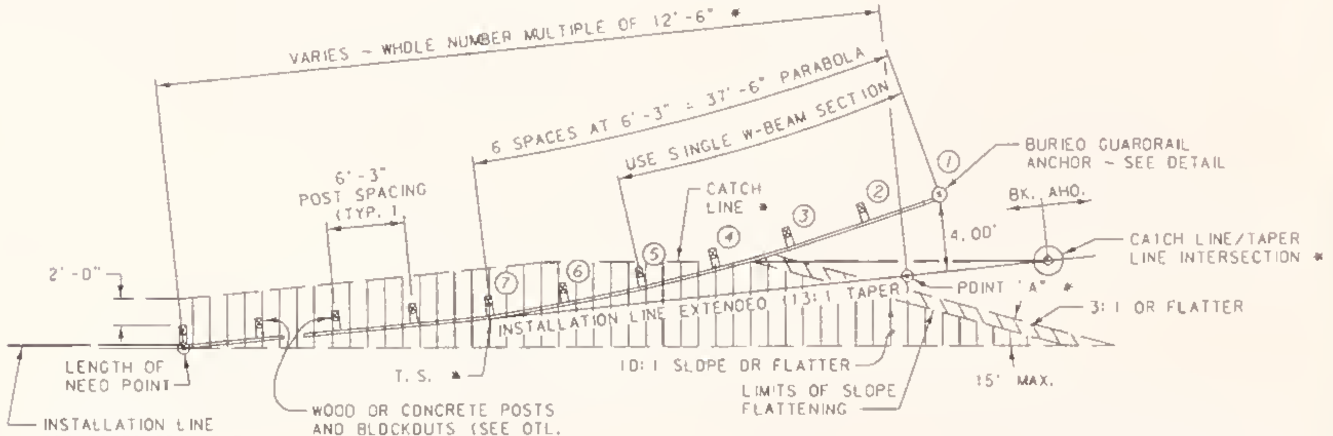
SECTION A-A



SECTION B-B


A
A
B
B
4"
BURY 1'-0" ±
1"
1¾" × 5¼" × 0.164" (8 GA.) WASHER WITH 11⁄16" DIA. HOLES
¾"
⅝" DIA. HEX HEAD BOLTS WITH STANDARD BOLT WASHERS EXCEPT WHERE NOTED
W8 × 18 × 6'-0" POST
5'-0", OR 2'-0" MIN. IF EMBEDMENT OF ANCHOR IS POURED AGAINST SOLID ROCK
CLASS AC OR DC CONCRETE
2"
1'-6" DIA.

BURIED GUARDRAIL ANCHOR DETAILS


VARIES ~ WHOLE NUMBER MULTIPLE OF 12'-6" *
6 SPACES AT 6'-3" = 37'-6" PARABOLA
USE SINGLE W-BEAM SECTION
6'-3" POST SPACING (TYP.)
CATCH LINE *
BURIED GUARDRAIL ANCHOR ~ SEE DETAIL
BK. AHD.
4.00'
CATCH LINE/TAPER LINE INTERSECTION *
POINT "A" *
3:1 OR FLATTER
2'-0"
①
②
③
④
⑤
⑥
⑦
INSTALLATION LINE EXTENDED (13:1 TAPER)
LENGTH OF NEED POINT
T. S. *
10:1 SLOPE OR FLATTER
LIMITS OF SLOPE FLATTENING
15' MAX.
INSTALLATION LINE PROJECTED FROM THE FACE OF THE LAST TWO POST BLOCKS IN THE STANDARD POST SECTION.
WOOD OR CONCRETE POSTS AND BLOCKOUTS (SEE DTL. DWG. NO. 606-05)

COMPACT SLOPES TO MEET THE DENSITY REQUIREMENTS OF STANDARD SPECIFICATION SECTION 203.03.

TERMINAL SECTION 3
(TO BE USED FOR CUT SLOPE EMBEDMENT)

* LAYOUT INSTRUCTIONS

1. LOCATE CATCH LINE. THE CATCH LINE IS THE LINE WHERE 10:1 SLOPE FLATTENING CATCHES ON THE BACKSLOPE.
2. EXTEND THE 13:1 TAPER FROM THE LENGTH OF NEED POINT AN ARBITRARY DISTANCE BEYOND THE CATCH LINE/TAPER LINE INTERSECTION.
3. LOCATE POINT "A" ON THE TAPER LINE, EITHER AHEAD OR BACK OF THE INTERSECTION, AT THE MULTIPLE OF 12'-6" NEAREST THE INTERSECTION.
4. DETERMINE THE BACKSLOPE RATE IN THE AREA BEYOND THE INTERSECTION.
5. LOCATE THE BEGINNING POINT (T. S.) OF THE 37'-6" PARABOLIC ARC ON THE 13:1 TAPER LINE IN ACCORDANCE WITH TABLE 1.
6. LAY OUT THE 37'-6" PARABOLIC ARC OFF THE 13:1 TAPER LINE USING PARABOLIC OFFSETS FROM TABLE 2.

TABLE 1 - PARABOLIC ARC BEGINNING POINTS

	DISTANCE AHEAD (AHD.) OR BACK (BK.) OF POINT "A" ON 13:1 TAPER						
BACK SLOPE	1:1	1.5:1	2:1	2.5:1	3:1	3.5:1	4:1
BEGINNING POINT OF PARABOLIC ARC (T. S.)	25.0' (BK.)	18.75' (BK.)	12.5' (BK.)	0.0'	12.5' (AHD.)	25.0' (AHD.)	37.5' (AHD.)

TABLE 2 - PARABOLIC OFFSET DISTANCES: INSTALLATION LINE TO FACE OF BLOCKOUT OR POST

POST NO.	①	②	③	④	⑤	⑥	⑦
OFFSET DISTANCE	4.00'	2.78'	1.78'	1.00'	0.44'	0.11'	0.00'

NOTE:
SEE PLANS FOR DRAINAGE DETAILS.

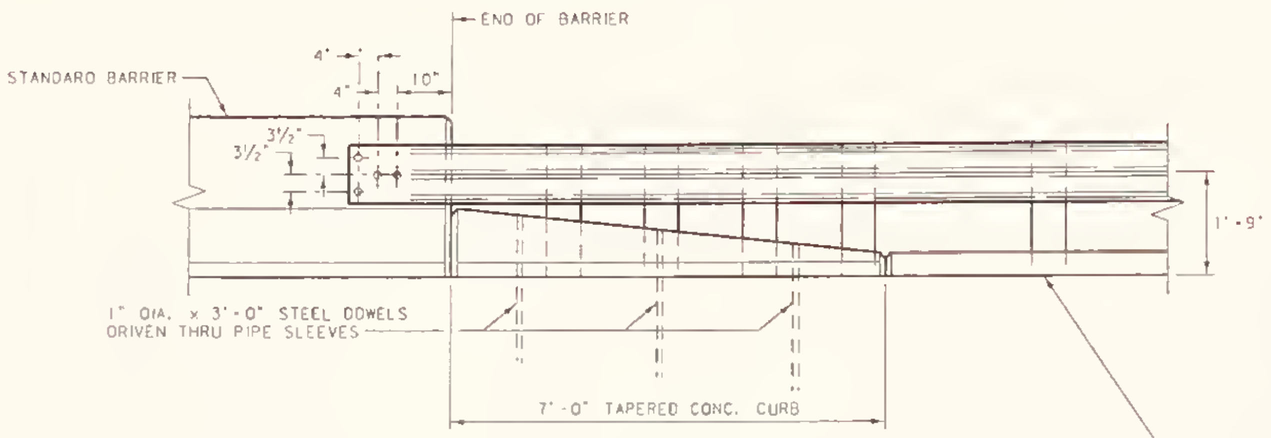
DETAILED DRAWING

REFERENCE STANDARD SPEC. SECTION 606	DWG. NO. 606-20

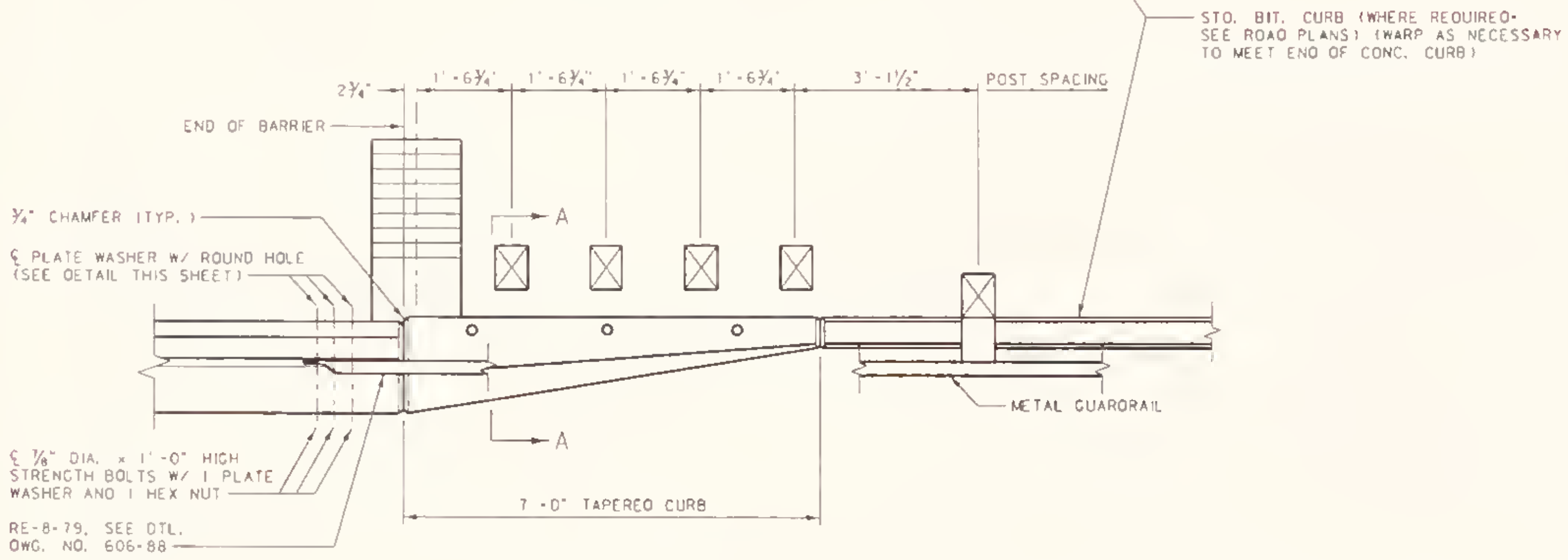
GUARDRAIL
TERMINAL SECTION 3

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

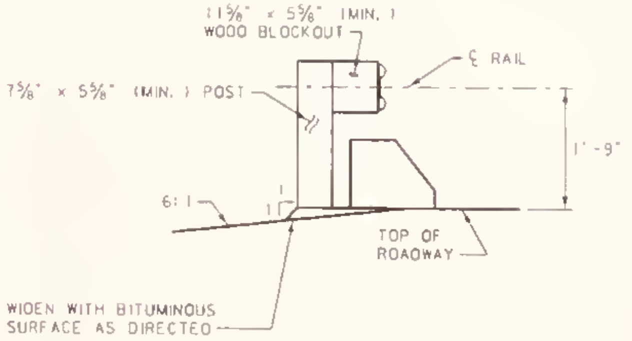


ELEVATION


STD. BIT. CURB (WHERE REQUIRED-SEE ROAD PLANS) (WARP AS NECESSARY TO MEET END OF CONC. CURB)
2¾"
1'-6¾"
1'-6¾"
1'-6¾"
1'-6¾"
3'-1½"
POST SPACING
END OF BARRIER
¾" CHAMFER (TYP.)
℄ PLATE WASHER W/ ROUND HOLE (SEE DETAIL THIS SHEET)
A
A
METAL GUARDRAIL
℄ ⅞" DIA. × 1'-0" HIGH STRENGTH BOLTS W/ 1 PLATE WASHER AND 1 HEX NUT
RE-8-79, SEE DTL. DWG. NO. 606-88
7'-0" TAPERED CURB

PLAN

DETAIL "A"


11⅝" × 5⅝" (MIN.) WOOD BLOCKOUT
℄ RAIL
7⅝" × 5⅝" (MIN.) POST
1'-9"
6:1
TOP OF ROADWAY
WIDEN WITH BITUMINOUS SURFACE AS DIRECTED

SECTION A-A

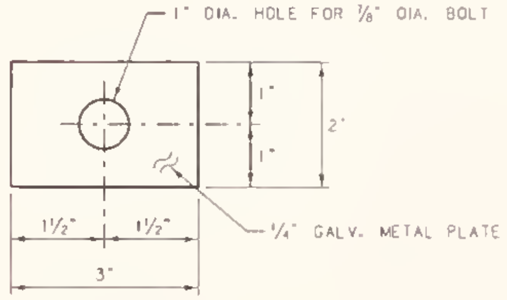


PLATE WASHER

NOTES:

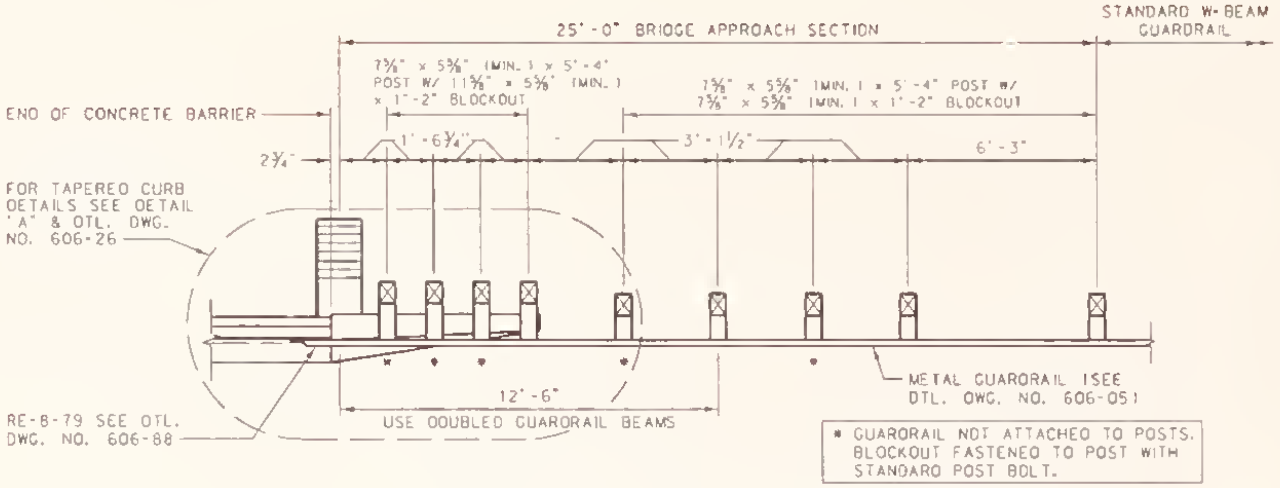
TAPERED CONCRETE CURBS:
TYPE 1, SEE DTL. DWG. NO. 606-26
TYPE 3, SEE DTL. DWG. NO. 606-27

CURB TAPERS ARE NOT REQUIRED WHEN EXISTING APPROACH SLABS ARE IN PLACE.

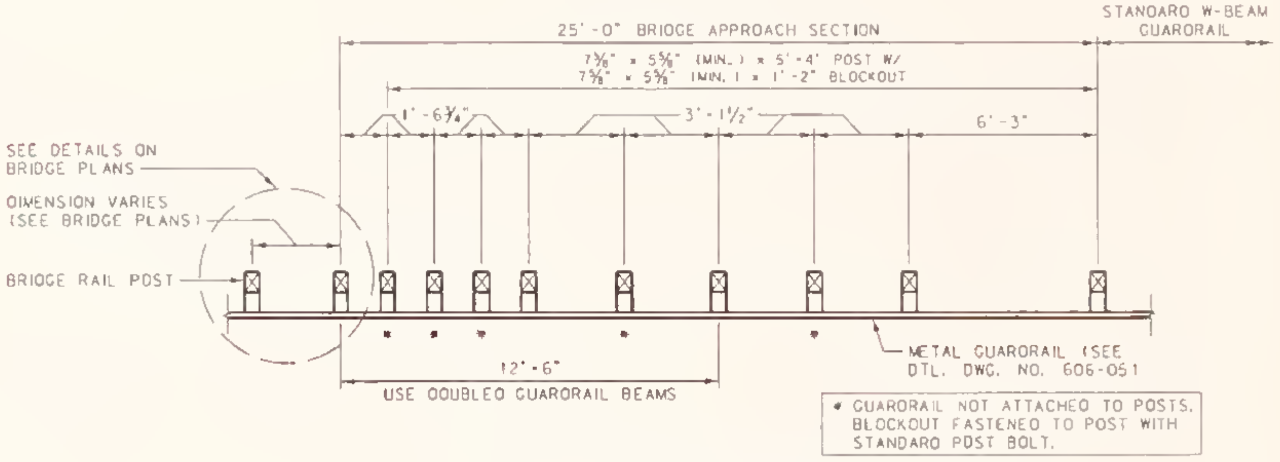
PORTIONS OF GUARDRAIL & BLOCKOUTS ARE OMITTED FOR CLARITY.

LAP GUARDRAIL IN THE DIRECTON OF THE ADJACENT TRAFFIC LANE. (SEE DTL. DWG. NO. 606-05.)

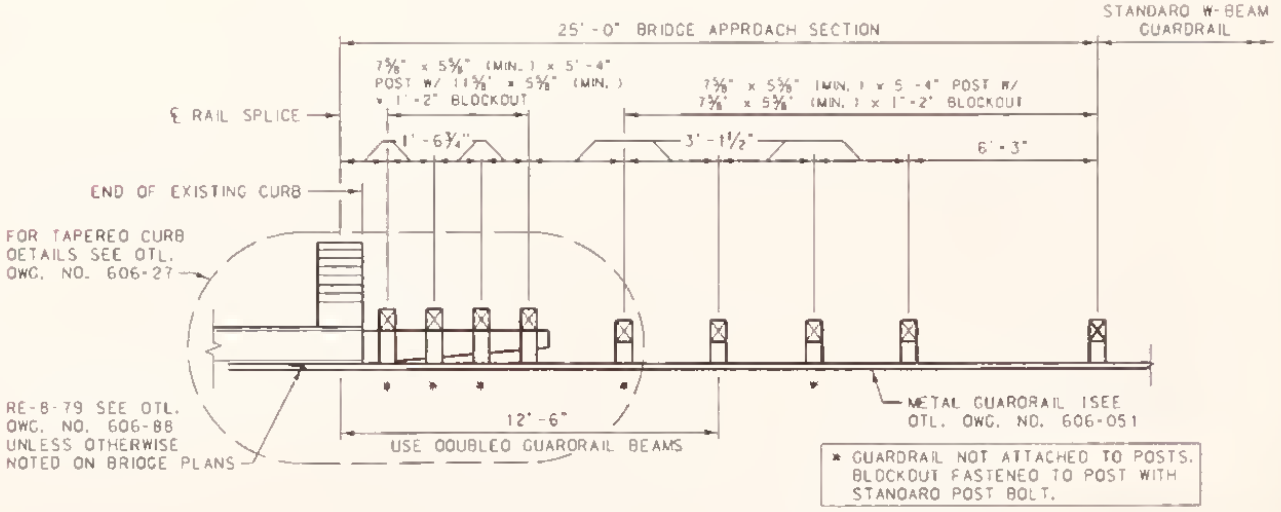
DO NOT FLARE BRIDGE APPROACH SECTIONS.


25'-0" BRIDGE APPROACH SECTION
STANDARD W-BEAM GUARDRAIL
7⅝" × 5⅝" (MIN.) × 5'-4" POST W/ 11⅝" × 5⅝" (MIN.) × 1'-2" BLOCKOUT
7⅝" × 5⅝" (MIN.) × 5'-4" POST W/ 7⅝" × 5⅝" (MIN.) × 1'-2" BLOCKOUT
END OF CONCRETE BARRIER
2¾"
1'-6¾"
3'-1½"
6'-3"
FOR TAPERED CURB DETAILS SEE DETAIL "A" & DTL. DWG. NO. 606-26
RE-8-79 SEE DTL. DWG. NO. 606-88
12'-6"
USE DOUBLED GUARDRAIL BEAMS
METAL GUARDRAIL (SEE DTL. DWG. NO. 606-05)
* GUARDRAIL NOT ATTACHED TO POSTS. BLOCKOUT FASTENED TO POST WITH STANDARD POST BOLT.

METAL GUARDRAIL-BRIDGE APPROACH SECTION TYPE 1
(FOR BRIDGES USING CONCRETE BARRIER RAIL)


25'-0" BRIDGE APPROACH SECTION
STANDARD W-BEAM GUARDRAIL
7⅝" × 5⅝" (MIN.) × 5'-4" POST W/ 7⅝" × 5⅝" (MIN.) × 1'-2" BLOCKOUT
1'-6¾"
3'-1½"
6'-3"
SEE DETAILS ON BRIDGE PLANS
DIMENSION VARIES (SEE BRIDGE PLANS)
BRIDGE RAIL POST
12'-6"
USE DOUBLED GUARDRAIL BEAMS
METAL GUARDRAIL (SEE DTL. DWG. NO. 606-05)
* GUARDRAIL NOT ATTACHED TO POSTS. BLOCKOUT FASTENED TO POST WITH STANDARD POST BOLT.

METAL GUARDRAIL-BRIDGE APPROACH SECTION TYPE 2
(FOR BRIDGES WITHOUT CURBS)

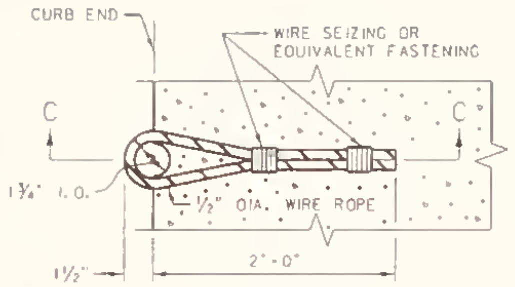

25'-0" BRIDGE APPROACH SECTION
STANDARD W-BEAM GUARDRAIL
7⅝" × 5⅝" (MIN.) × 5'-4" POST W/ 11⅝" × 5⅝" (MIN.) × 1'-2" BLOCKOUT
7⅝" × 5⅝" (MIN.) × 5'-4" POST W/ 7⅝" × 5⅝" (MIN.) × 1'-2" BLOCKOUT
℄ RAIL SPLICE
1'-6¾"
3'-1½"
6'-3"
END OF EXISTING CURB
FOR TAPERED CURB DETAILS SEE DTL. DWG. NO. 606-27
RE-8-79 SEE DTL. DWG. NO. 606-88 UNLESS OTHERWISE NOTED ON BRIDGE PLANS
12'-6"
USE DOUBLED GUARDRAIL BEAMS
METAL GUARDRAIL (SEE DTL. DWG. NO. 606-05)
* GUARDRAIL NOT ATTACHED TO POSTS. BLOCKOUT FASTENED TO POST WITH STANDARD POST BOLT.

METAL GUARDRAIL-BRIDGE APPROACH SECTION TYPE 3
(FOR BRIDGES WITH EXISTING CONCRETE CURBS)

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 606
DWG. NO.
606-25

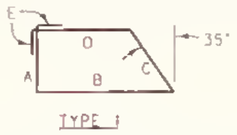
BRIDGE APPROACH
SECTIONS

EFFECTIVE: AUGUST 1999
MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



WIRE ROPE DETAIL

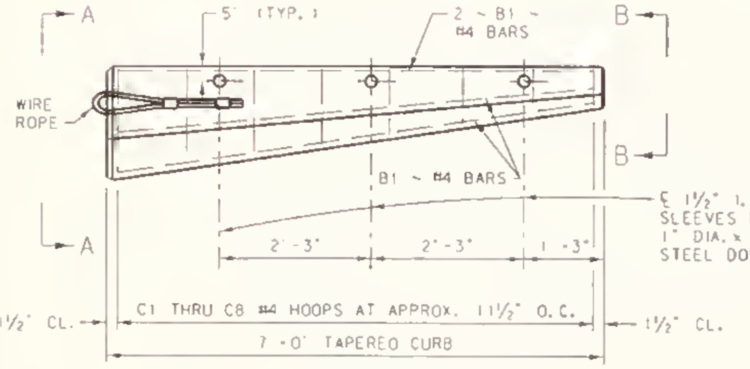
BILL OF REINFORCING STEEL (ONE SECTION ONLY)



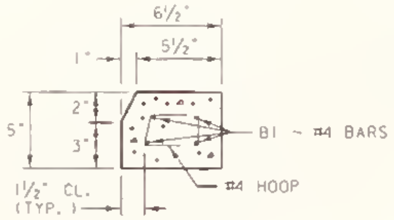
TYPE I

BENT BARS (ALL DIMENSIONS ARE OUT TO OUT)

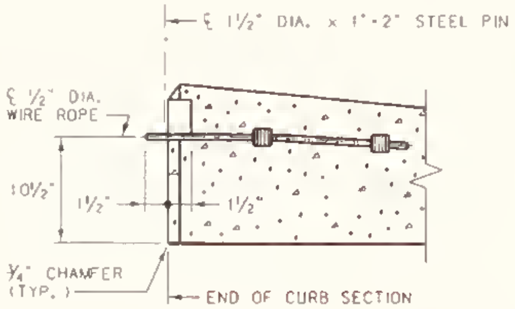
MARK	SIZE	NO.	TYPE	LENGTH	A	B	C	D	E
C1	#4	1	1	4'-8"	11"	1'-4"	1'-1"	9"	3½"
C2				4'-2"	9½"	1'-2"	11½"	8"	
C3				3'-9"	8½"	1'-½"	10"	7"	
C4				3'-3"	7"	10½"	8"	6½"	
C5				2'-11"	6"	9"	7"	6"	
C6				2'-4"	4"	7"	5"	5"	
C7				2'-0"	3½"	5½"	3½"	4½"	
C8		1	1	1'-6"	2"	3½"	2"	3½"	3½"
B1	#4	4	STRAIGHT	6'-9"	~	~	~	~	~



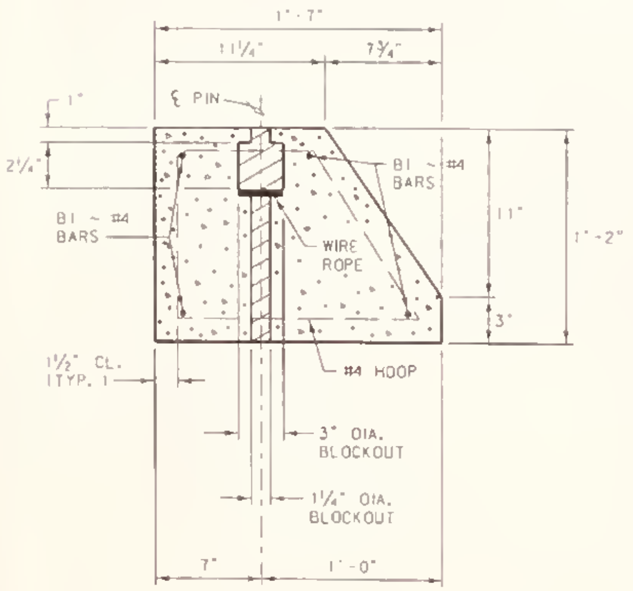
PLAN



VIEW B-B



SECTION C-C



VIEW A-A

NOTES:

TAPERED CONCRETE CURB IS USED WITH BRIDGE APPROACH SECTION TYPE I (SEE DTL. DWG. NO. 606-25).

WIRE ROPE CONSISTS OF ZINC-COATED STEEL WIRE 7 STRAND UTILITY GRADE WITH A MINIMUM BREAKING STRENGTH OF 25,000 LB., CONFORMING TO ASTM SPECIFICATION A 475.

ALL REINFORCING STEEL IS OF THE DEFORMED TYPE, MEETING THE REQUIREMENTS OF AASHTO M 31 (ASTM A 615, GRADE 60).

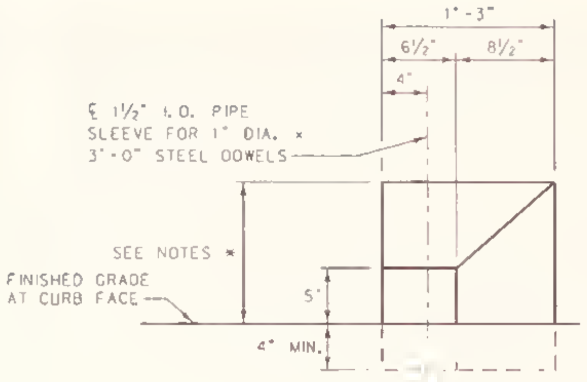
ALL CONCRETE IS CLASS "DD".
TOTAL CONCRETE PER 7' TAPERED CURB EST. = 0.2 C.Y.
TOTAL REBAR WEIGHT PER 7' TAPERED CURB EST. = 34 LB.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 606
DWG. NO.
606-26

TAPERED CONCRETE
CURB DETAIL

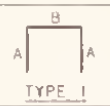
EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD


1'-3"
6½"
8½"
4"
℄ 1½" I.D. PIPE SLEEVE FOR 1" DIA. x 3'-0" STEEL DOWELS
SEE NOTES *
FINISHED GRADE AT CURB FACE
5"
4" MIN.

END VIEW

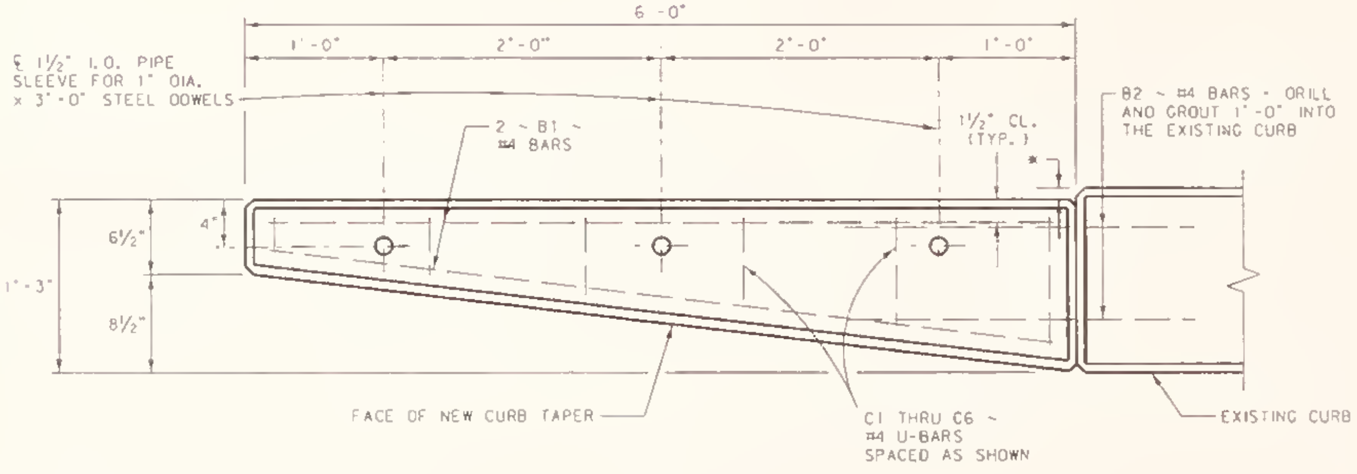
BILL OF REINFORCING STEEL (ONE SECTION ONLY)



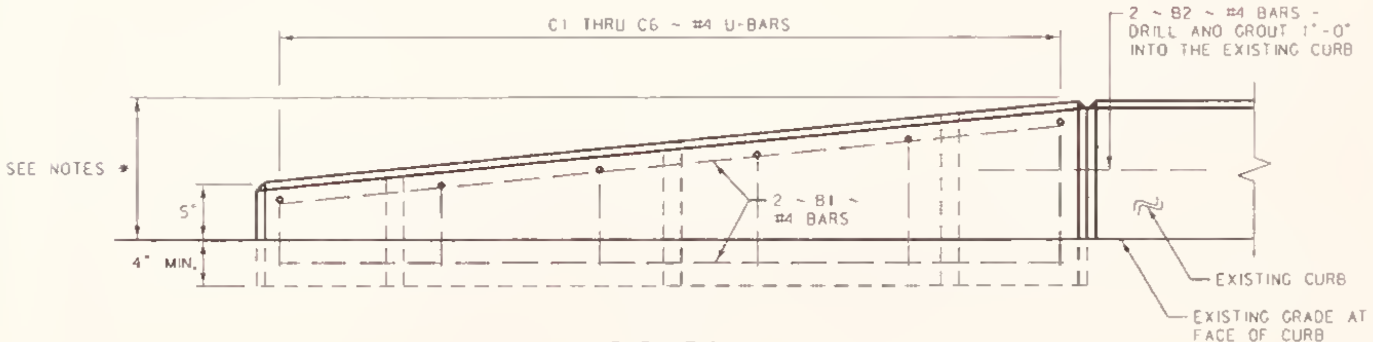
TYPE I

BENT BARS (ALL DIMENSIONS ARE OUT TO OUT)

MARK	SIZE	NO.	TYPE	LENGTH	A	B
C1	#4	1	1	1'-4"	6"	4"
C2				1'-8"	7"	6"
C3				1'-11"	8"	7"
C4				2'-3"	9"	9"
C5				2'-6"	10"	10"
C6		1	1	2'-10"	11"	1'-0"
B1		4	STRAIGHT	5'-8"	~	~
B2	#4	2	STRAIGHT	2'-0"	~	~


6'-0"
1'-0"
2'-0"
2'-0"
1'-0"
℄ 1½" I.D. PIPE SLEEVE FOR 1" DIA. x 3'-0" STEEL DOWELS
2 ~ B1 ~ #4 BARS
1½" CL. (TYP.)
*
B2 ~ #4 BARS - DRILL AND GROUT 1'-0" INTO THE EXISTING CURB
4"
6½"
1'-3"
8½"
FACE OF NEW CURB TAPER
C1 THRU C6 ~ #4 U-BARS SPACED AS SHOWN
EXISTING CURB

PLAN


C1 THRU C6 ~ #4 U-BARS
2 ~ B2 ~ #4 BARS - DRILL AND GROUT 1'-0" INTO THE EXISTING CURB
SEE NOTES *
5"
2 ~ B1 ~ #4 BARS
4" MIN.
EXISTING CURB
EXISTING GRADE AT FACE OF CURB

ELEVATION

NOTES:

REMOVE THE EXISTING SURFACE UNDER THE NEW CONCRETE CURB TAPERS AS APPROVED BY THE ENGINEER. EMBED THE CURB TAPER A MINIMUM OF 4" BELOW THE GRADE MEASURED AT THE INSIDE FACE OF THE TAPER.

ALL REINFORCING STEEL IS OF THE DEFORMED TYPE, MEETING THE REQUIREMENTS OF AASHTO M 31 (ASTM A 615, GRADE 60).

ALL CONCRETE IS CLASS "DD".
TOTAL CONCRETE PER 6' TAPERED CURB EST. = 0.2 C.Y.
TOTAL REBAR WEIGHT PER 6' TAPERED CURB EST. = 27 LB.

TAPERED CONCRETE CURB IS USED WITH BRIDGE APPROACH SECTION TYPE 3 (SEE DTL. DWG. NO. 606-25).

* ADJUST DIMENSION TO MATCH EXISTING CURB.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 606
DWG. NO.
606-27

TAPERED CONCRETE
CURB DETAIL

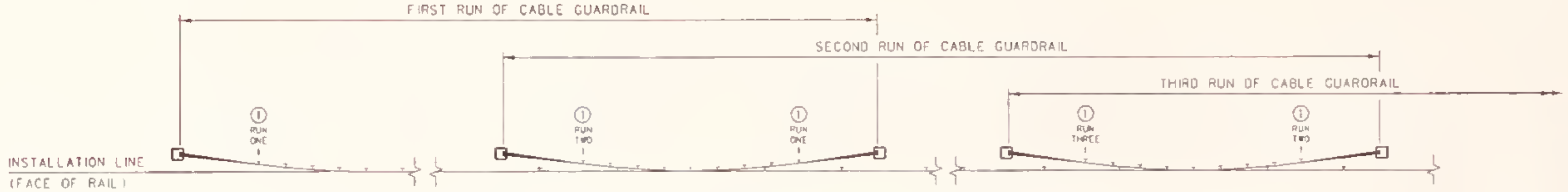
EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

TERMINAL DETAILS						
POST	DISTANCE FROM ANCHOR	OFFSET FROM INSTALL. LINE	CABLE FASTENER			BASE PLATES
			TYPE	QUANTITY	DESCRIPTION	
5	42'	0'-0"	F-1-76	3	HOOK BOLT	~
4	36'	0'-2"	F-1-76	3	HOOK BOLT	~
3	30'	0'-6"	F-1-76	3	HOOK BOLT	~
2	24'	1'-0"	P-2-79	1	END CAP	P-2-79
1	18'	1'-8"	P-2-79	1	END CAP	P-2-79
ANCHOR	0'	4'-0'	THREE CABLE END ASSEMBLIES *			

SCHEDULE OF HARDWARE *		
DESIGNATION	DESCRIPTION	DTL. DWG. NO.
F-1-76	5/16" DIA. HOOK BOLT	606-82
F-10(4 1/2")-79	3/4" DIA. HEX BOLT & NUT & WASHER	606-82
P-1-76	STRUCTURAL SHAPE LINE POST (STEEL)	606-92
P-2-79	END POST FITTINGS	606-90
P-46-76	BENT PLATE LINE POST (STEEL)	606-92
RE-1-76	3/4" DIA. WIRE ROPE (3x7)	606-94

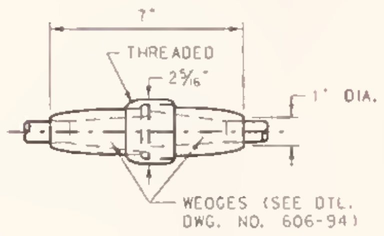
* SEE ARTBA TECHNICAL BULLETIN NO. 268-B (AGC STD. FORM NO. 1311 "A GUIDE TO STANDARDIZED HIGHWAY BARRIER RAIL HARDWARE."


FIRST RUN OF CABLE GUARDRAIL
SECOND RUN OF CABLE GUARDRAIL
THIRD RUN OF CABLE GUARDRAIL
① RUN ONE
① RUN TWO
① RUN ONE
① RUN THREE
① RUN TWO
INSTALLATION LINE
(FACE OF RAIL)

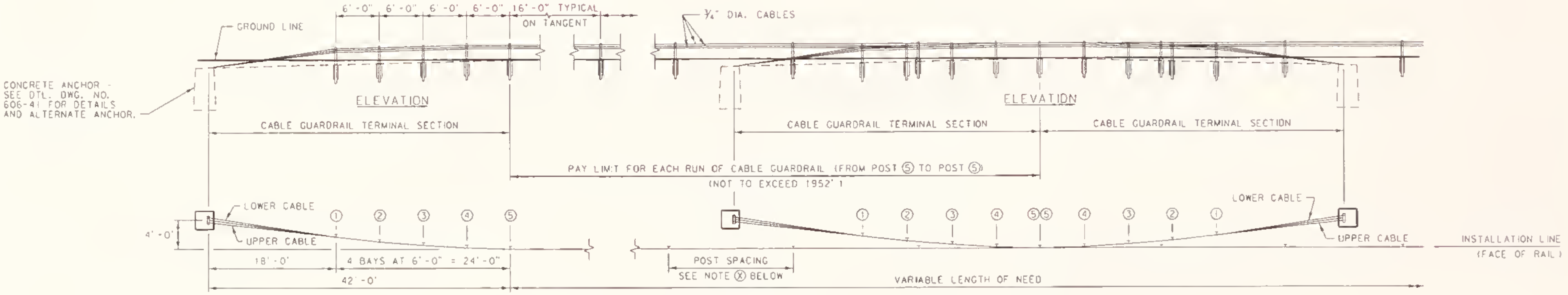
TYPICAL LAYOUT FOR MULTIPLE RUNS OF CABLE GUARDRAIL

EACH RUN OF CABLE GUARDRAIL CONTAINS TWO TERMINAL SECTIONS WITH ANCHOR ASSEMBLIES.

SPLICE CABLE USING A COUPLING DEVICE AS SHOWN, OR AN ALTERNATE METHOD APPROVED BY THE ENGINEER.

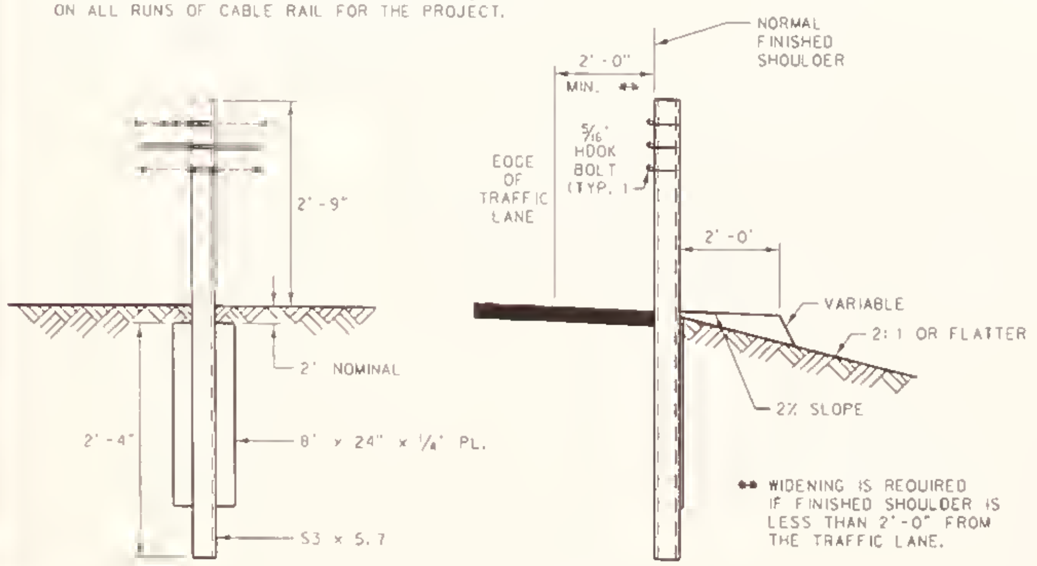


CABLE SPLICE

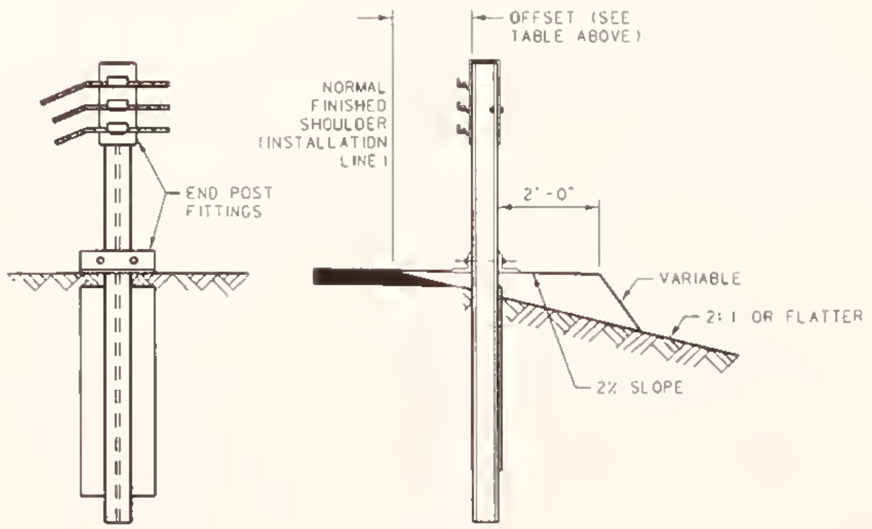


PLAN

NOTE:
EITHER LINE POST (STRUCTURAL SHAPE OR BENT PLATE) MAY BE USED THROUGH THE RUN, BUT USE ONLY STRUCTURAL SHAPE POSTS ON THE ENDS. MAINTAIN A CONSISTENT TYPE OF POST ON ALL RUNS OF CABLE RAIL FOR THE PROJECT.



TYPICAL INSTALLATION DETAIL
INTERMEDIATE POST



TYPICAL INSTALLATION DETAIL
END POSTS

NOTES:

FOR CABLE GUARDRAIL RUNS OF:
- 532 FEET OR LESS: USE COMPENSATING ASSEMBLY ON ONE END AND TURNBUCKLE END ASSEMBLY ON THE OTHER END OF EACH CABLE.
- GREATER THAN 532 FEET, UP TO 2036 FEET MAXIMUM: USE COMPENSATING END ASSEMBLY ON BOTH ENDS OF EACH CABLE.

SEE DTL. DWG. NO. 606-94 FOR TURNBUCKLE AND COMPENSATING END ASSEMBLY DETAILS.

ⓧ LINE POST SPACING:
- TANGENTS AND CURVES OF LESS THAN 8 DEGREES: 16 FT.
- CURVES GREATER THAN 8 DEGREES, UP TO 25 DEGREES: 12 FT.
- NOTE: DO NOT INSTALL CABLE GUARDRAIL ON THE INSIDE SHOULDER OF ANY CURVE.

UNIFORMLY TENSION ALL CABLES TO COMPRESS SPRINGS BY 3 1/2"

DO NOT INSTALL CABLE GUARDRAIL FOR OBSTACLES WITHIN 12 FEET OF THE INSTALLATION LINE.

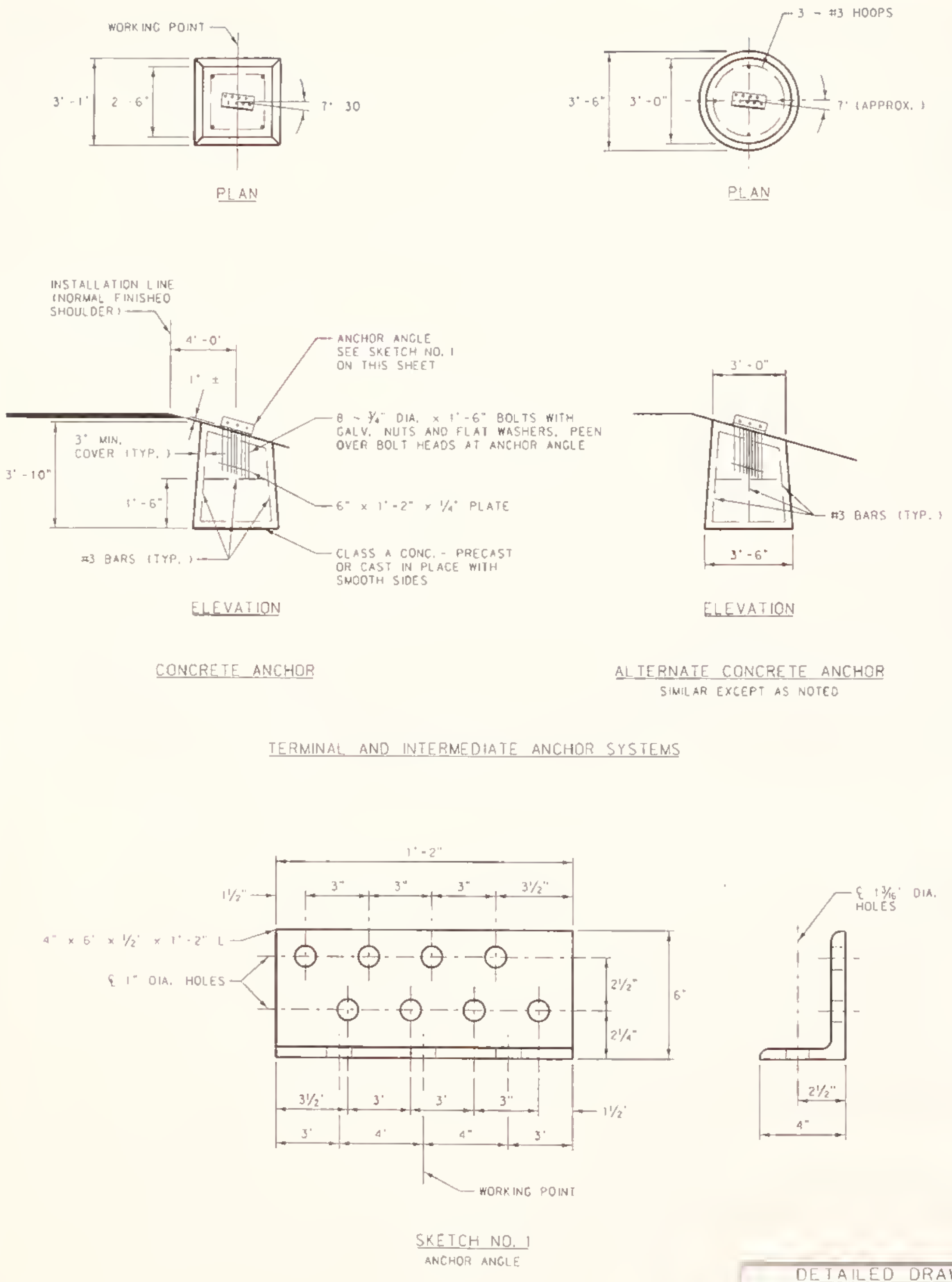
DO NOT USE CABLE GUARDRAIL WITH FILL SLOPES STEEPER THAN 2:1, UNLESS THE DISTANCE BETWEEN THE BACK OF THE POSTS AND THE BREAK IN THE FILL SLOPE IS AT LEAST 8 FEET.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 606
DWG. NO.
606-40

CABLE GUARDRAIL

EFFECTIVE: AUGUST 1999

MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

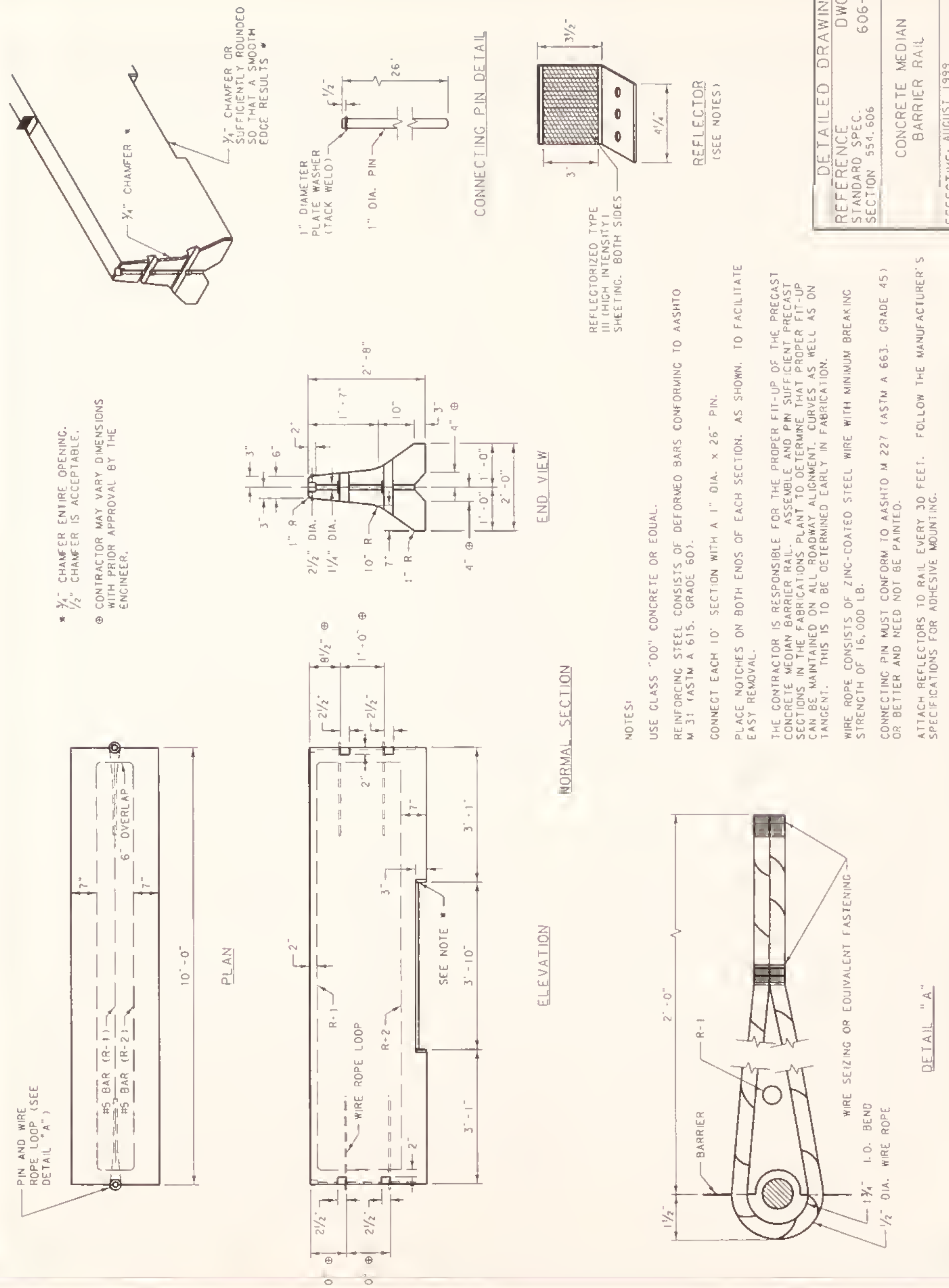


DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 606
DWG. NO.
606-41

CABLE GUARDRAIL
ANCHOR DETAILS

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



* ¾" CHAMFER ENTIRE OPENING. ½" CHAMFER IS ACCEPTABLE.

⊕ CONTRACTOR MAY VARY DIMENSIONS WITH PRIOR APPROVAL BY THE ENGINEER.

NOTES:

USE CLASS "DD" CONCRETE OR EQUAL.

REINFORCING STEEL CONSISTS OF DEFORMED BARS CONFORMING TO AASHTO M 31 (ASTM A 615, GRADE 60).

CONNECT EACH 10' SECTION WITH A 1" DIA. × 26" PIN.

PLACE NOTCHES ON BOTH ENDS OF EACH SECTION, AS SHOWN, TO FACILITATE EASY REMOVAL.

THE CONTRACTOR IS RESPONSIBLE FOR THE PROPER FIT-UP OF THE PRECAST CONCRETE MEDIAN BARRIER RAIL. ASSEMBLE AND PIN SUFFICIENT PRECAST SECTIONS IN THE FABRICATIONS PLANT TO DETERMINE THAT PROPER FIT-UP CAN BE MAINTAINED ON ALL ROADWAY ALIGNMENT. CURVES AS WELL AS ON TANGENT. THIS IS TO BE DETERMINED EARLY IN FABRICATION.

WIRE ROPE CONSISTS OF ZINC-COATED STEEL WIRE WITH MINIMUM BREAKING STRENGTH OF 16,000 LB.

CONNECTING PIN MUST CONFORM TO AASHTO M 227 (ASTM A 663, GRADE 45) OR BETTER AND NEED NOT BE PAINTED.

ATTACH REFLECTORS TO RAIL EVERY 30 FEET. FOLLOW THE MANUFACTURER'S SPECIFICATIONS FOR ADHESIVE MOUNTING.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 554.606
DWG. NO.
606-44

CONCRETE MEDIAN
BARRIER RAIL

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

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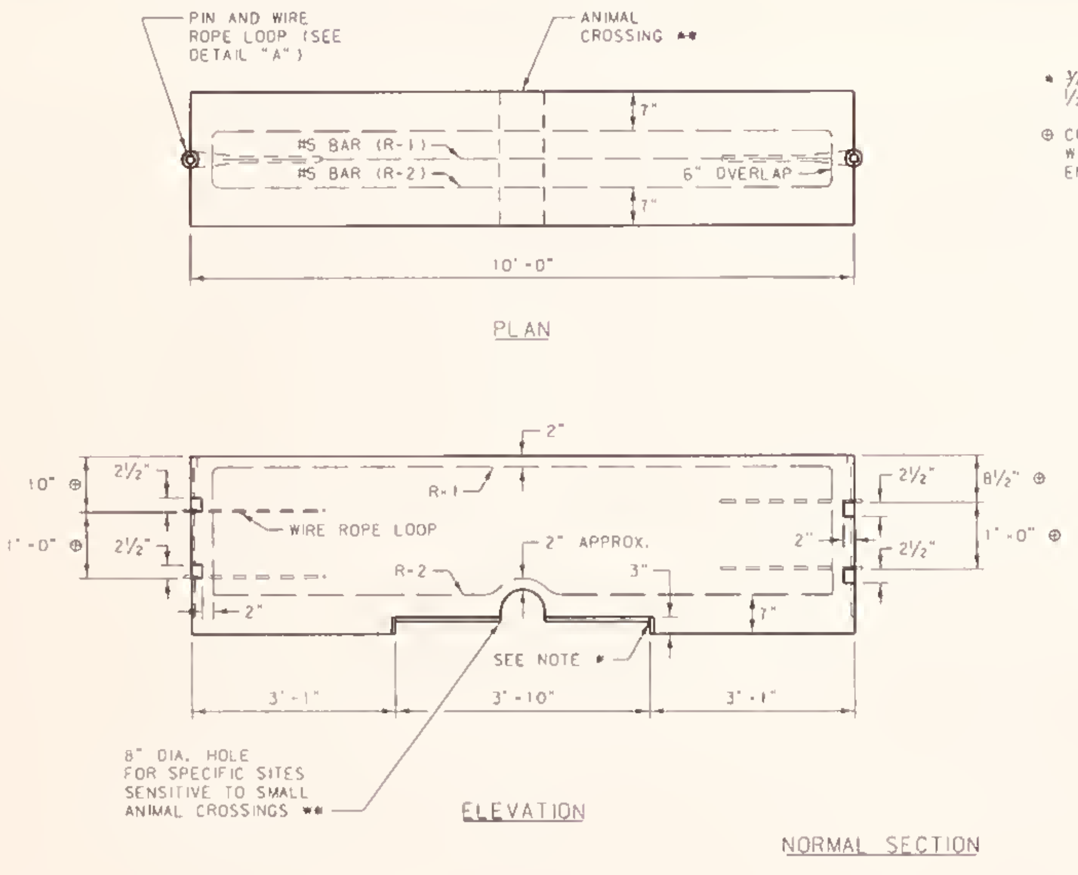
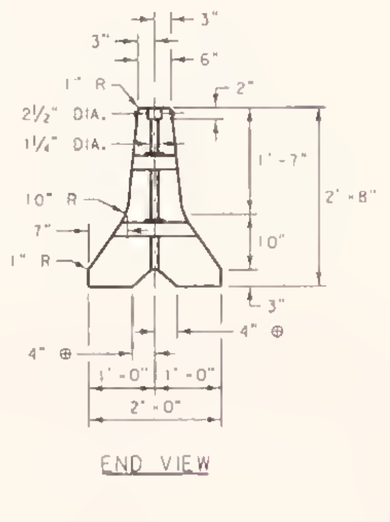
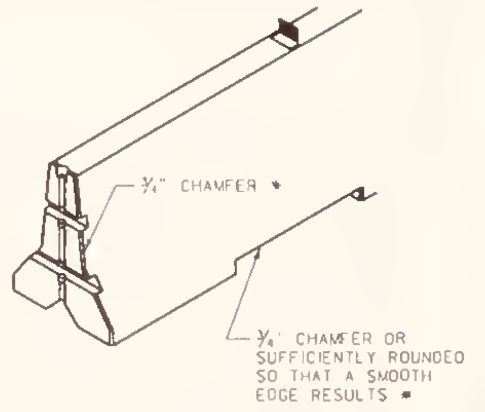


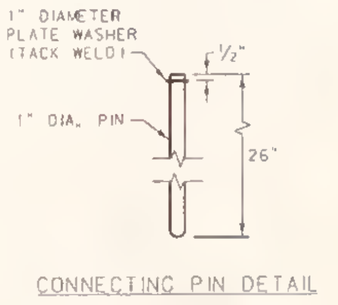


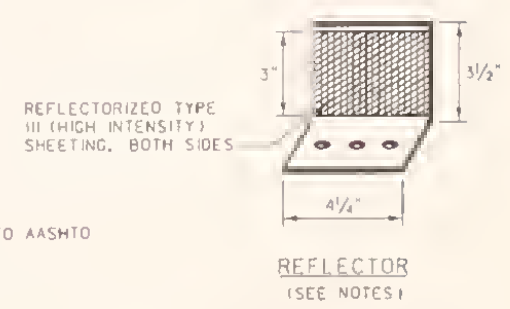
NORMAL SECTION

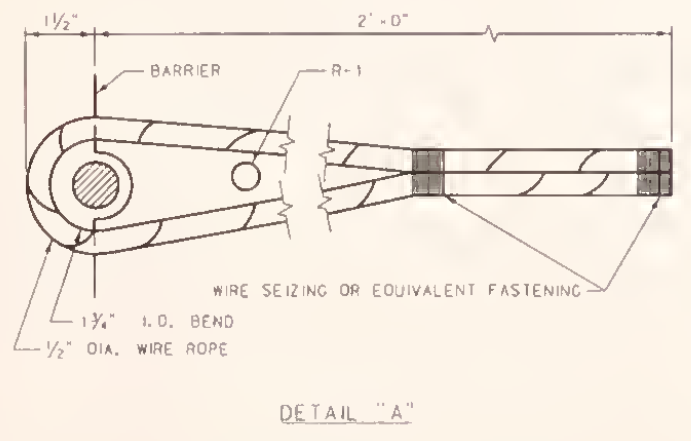
* ¾" CHAMFER ENTIRE OPENING.
½" CHAMFER IS ACCEPTABLE.

⊕ CONTRACTOR MAY VARY DIMENSIONS WITH PRIOR APPROVAL BY THE ENGINEER.


¾" CHAMFER *
¾" CHAMFER OR SUFFICIENTLY ROUNDED SO THAT A SMOOTH EDGE RESULTS *




3"
3½"
REFLECTORIZED TYPE III (HIGH INTENSITY) SHEETING, BOTH SIDES
4¼"
REFLECTOR
(SEE NOTES)



NOTES:

USE CLASS "DD" CONCRETE OR EQUAL.

REINFORCING STEEL CONSISTS OF DEFORMED BARS CONFORMING TO AASHTO M 31 (ASTM A 615, GRADE 60).

CONNECT EACH 10' SECTION WITH A 1" DIA. × 26" PIN.

PLACE NOTCHES ON BOTH ENDS OF EACH SECTION, AS SHOWN, TO FACILITATE EASY REMOVAL.

THE CONTRACTOR IS RESPONSIBLE FOR THE PROPER FIT-UP OF THE PRECAST CONCRETE MEDIAN BARRIER RAIL. ASSEMBLE AND PIN SUFFICIENT PRECAST SECTIONS IN THE FABRICATIONS PLANT TO DETERMINE THAT PROPER FIT-UP CAN BE MAINTAINED ON ALL ROADWAY ALIGNMENT, CURVES AS WELL AS ON TANGENT. THIS IS TO BE DETERMINED EARLY IN FABRICATION.

WIRE ROPE CONSISTS OF ZINC-COATED STEEL WIRE WITH MINIMUM BREAKING STRENGTH OF 16,000 LB.

CONNECTING PIN MUST CONFORM TO AASHTO M 227 (ASTM A 663, GRADE 45) OR BETTER AND NEED NOT BE PAINTED.

ATTACH REFLECTORS TO RAIL EVERY 30 FEET. FOLLOW THE MANUFACTURER'S SPECIFICATIONS FOR ADHESIVE MOUNTING.

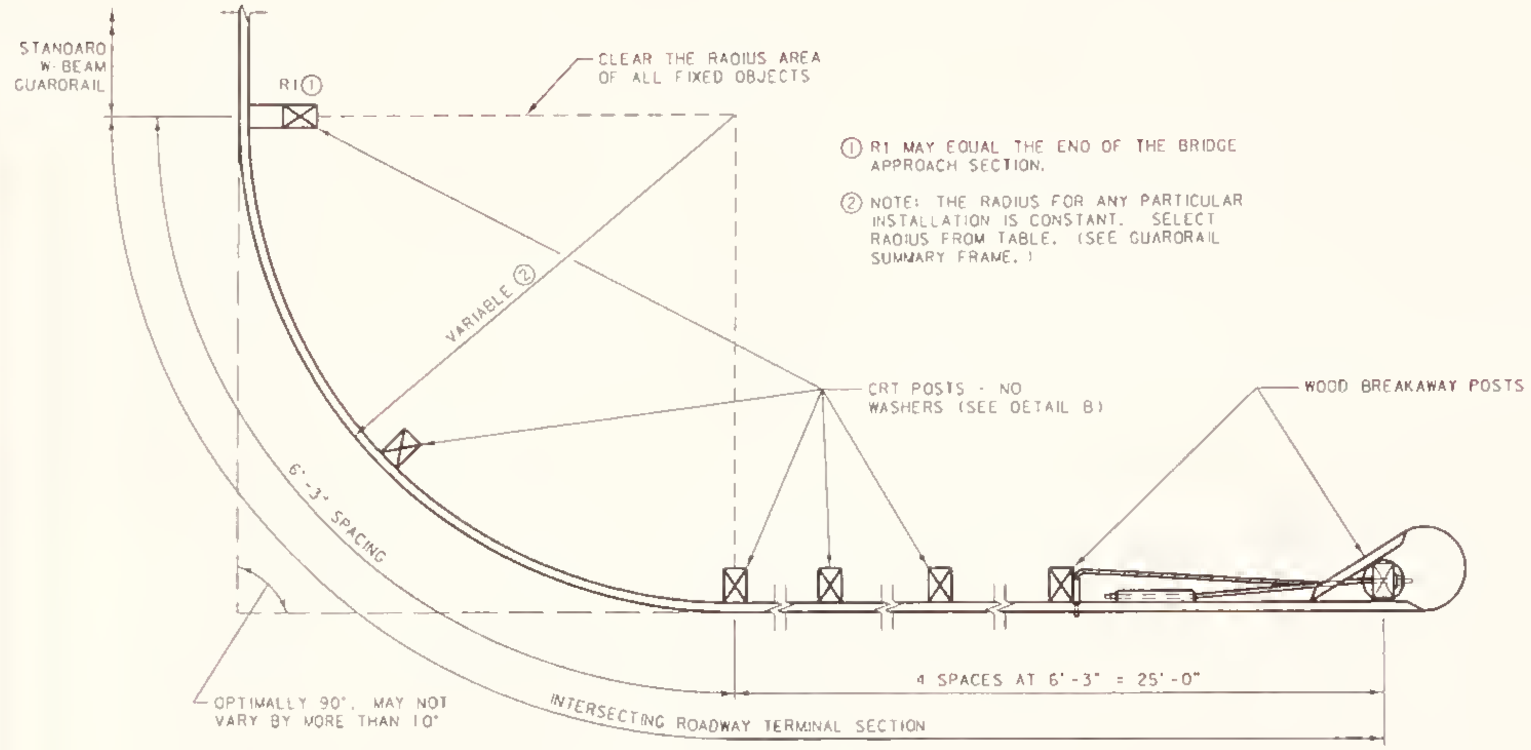
** USE THIS RAIL ON A CASE-BY-CASE BASIS AS SPECIFIED IN THE PLANS.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 554.606
DWG. NO.
606-45

ALTERNATE
CONCRETE MEDIAN
BARRIER RAIL

EFFECTIVE: AUGUST 1999

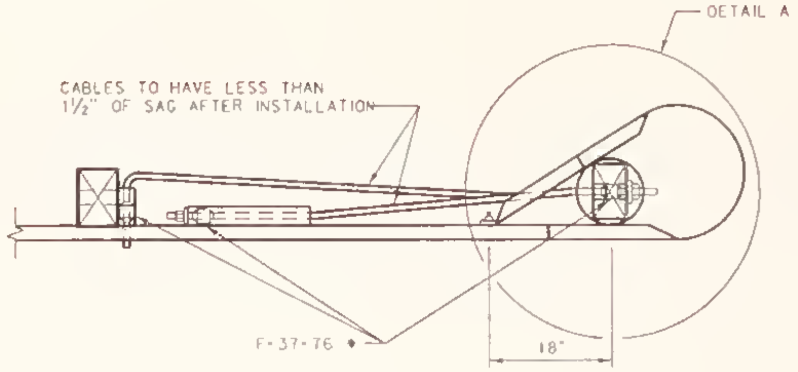
MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

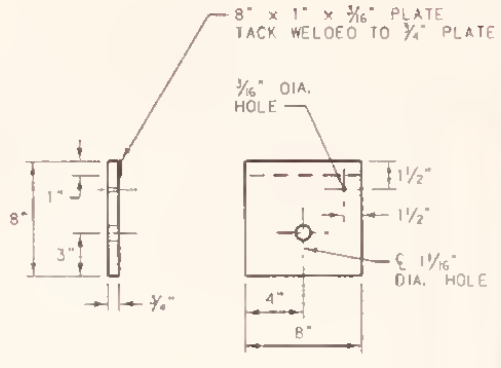

STANDARD W-BEAM GUARDRAIL
R1 ①
CLEAR THE RADIUS AREA OF ALL FIXED OBJECTS
VARIABLE ②
6'-3" SPACING
CRT POSTS - NO WASHERS (SEE DETAIL B)
WOOD BREAKAWAY POSTS
OPTIMALLY 90°. MAY NOT VARY BY MORE THAN 10°
4 SPACES AT 6'-3" = 25'-0"
INTERSECTING ROADWAY TERMINAL SECTION

① R1 MAY EQUAL THE END OF THE BRIDGE APPROACH SECTION.

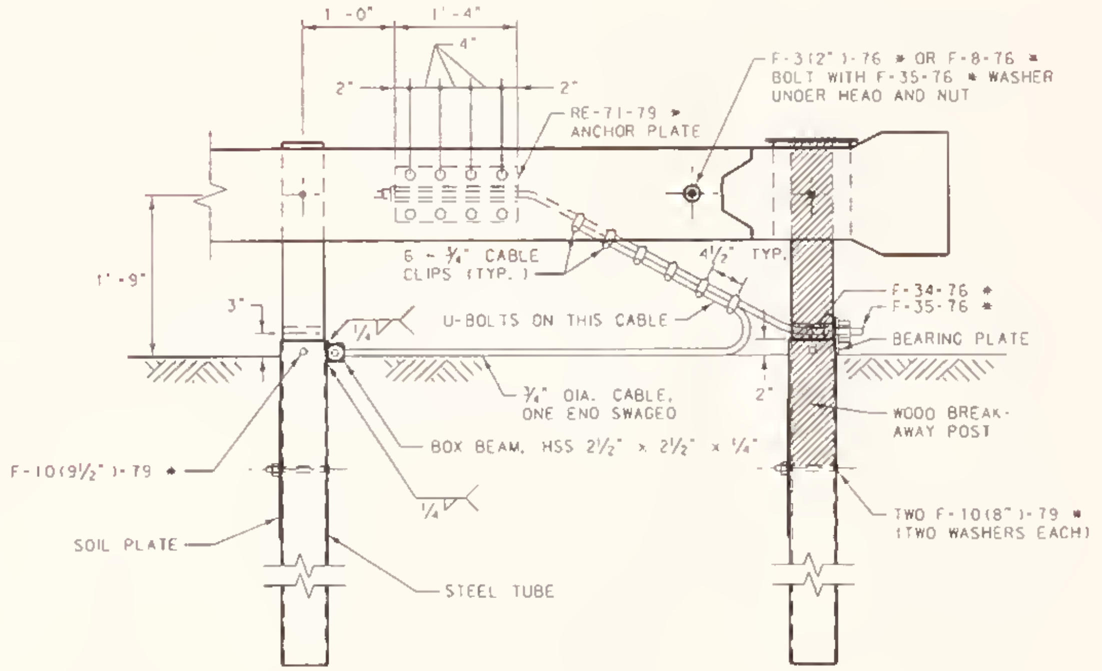
② NOTE: THE RADIUS FOR ANY PARTICULAR INSTALLATION IS CONSTANT. SELECT RADIUS FROM TABLE. (SEE GUARDRAIL SUMMARY FRAME.)

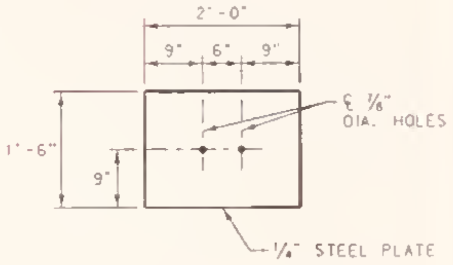
PLAN





BEARING PLATE DETAIL

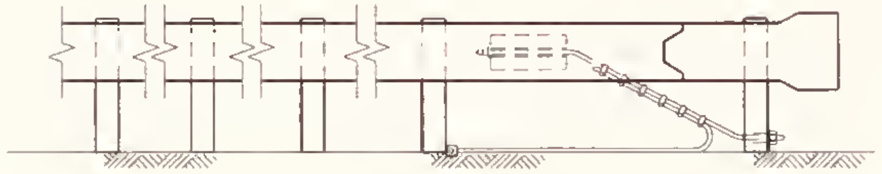

1'-0"
1'-4"
4"
2"
2"
RE-71-79 * ANCHOR PLATE
F-3(2")-76 * OR F-8-76 * BOLT WITH F-35-76 * WASHER UNDER HEAD AND NUT
1'-9"
3"
6 - ¾" CABLE CLIPS (TYP.)
4½" TYP.
F-34-76 *
F-35-76 *
U-BOLTS ON THIS CABLE
BEARING PLATE
¼
¾" DIA. CABLE, ONE END SWAGED
2"
2"
BOX BEAM, HSS 2½" x 2½" x ¼"
WOOD BREAKAWAY POST
F-10(9½")-79 *
¼
SOIL PLATE
TWO F-10(8")-79 * (TWO WASHERS EACH)
STEEL TUBE



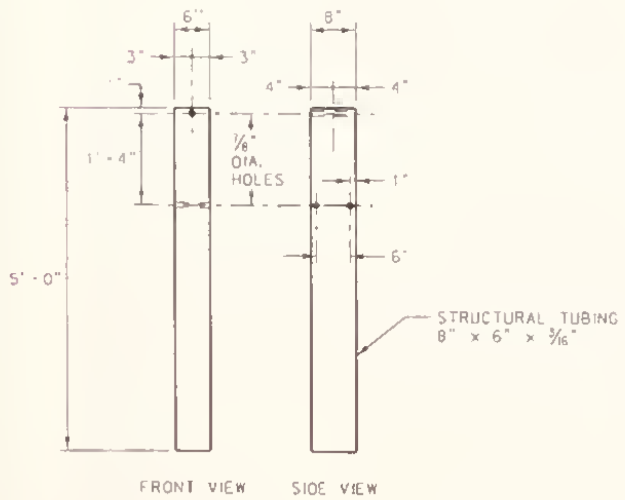
SOIL PLATE DETAIL

RADIUS TABLE

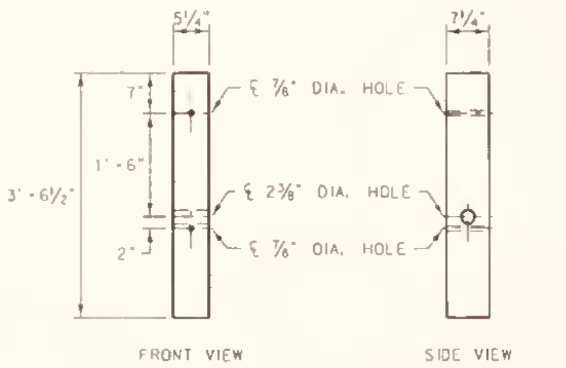
RADIUS	LENGTH OF BENT RAIL
8'	12.5'
16'	25.0'
24'	37.5'
32'	50.0'



ELEVATION



STEEL TUBE DETAILS

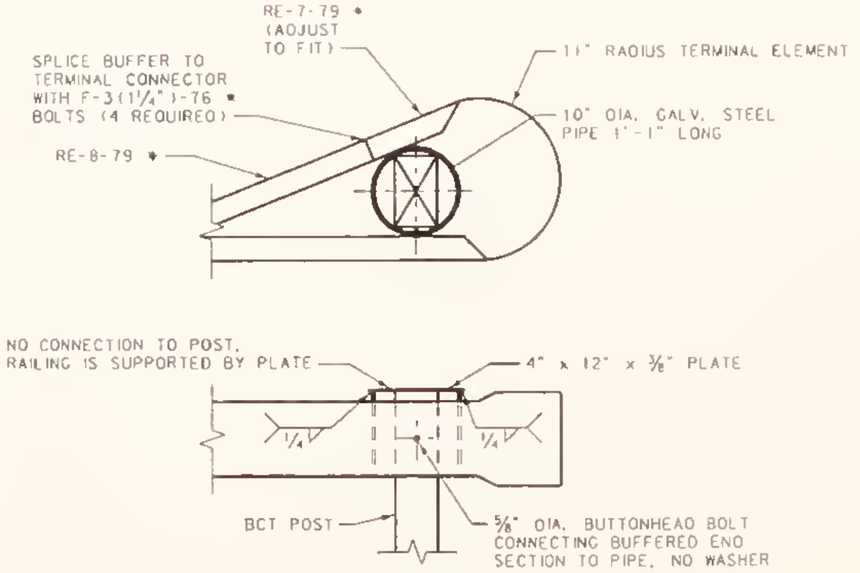


WOOD BREAKAWAY POST DETAILS

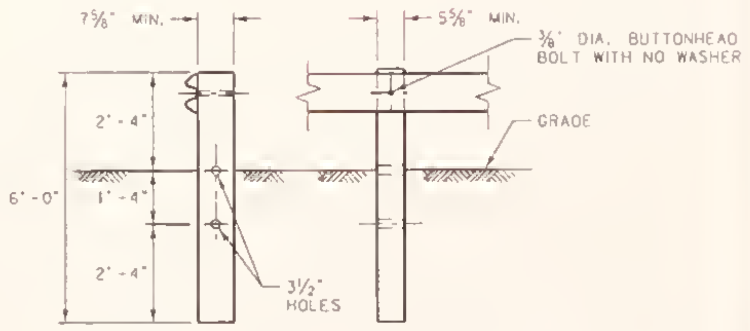
NOTES:

SEE DTL. DWG. NO. 606-05 FOR GUARDRAIL WIDENING REQUIREMENTS.

* SEE DTL. DWG. NO. 606-80 FOR SCHEDULE OF GUARDRAIL HARDWARE.


RE-7-79 * (ADJUST TO FIT)
11" RADIUS TERMINAL ELEMENT
SPLICE BUFFER TO TERMINAL CONNECTOR WITH F-3(1¼")-76 * BOLTS (4 REQUIRED)
10" DIA. GALV. STEEL PIPE 1'-1" LONG
RE-8-79 *
NO CONNECTION TO POST. RAILING IS SUPPORTED BY PLATE
4" x 12" x 3⁄8" PLATE
¼
¼
BCT POST
5⁄8" DIA. BUTTONHEAD BOLT CONNECTING BUFFERED END SECTION TO PIPE, NO WASHER

DETAIL A



CONTROLLED RELEASING TERMINAL (CRT) POST

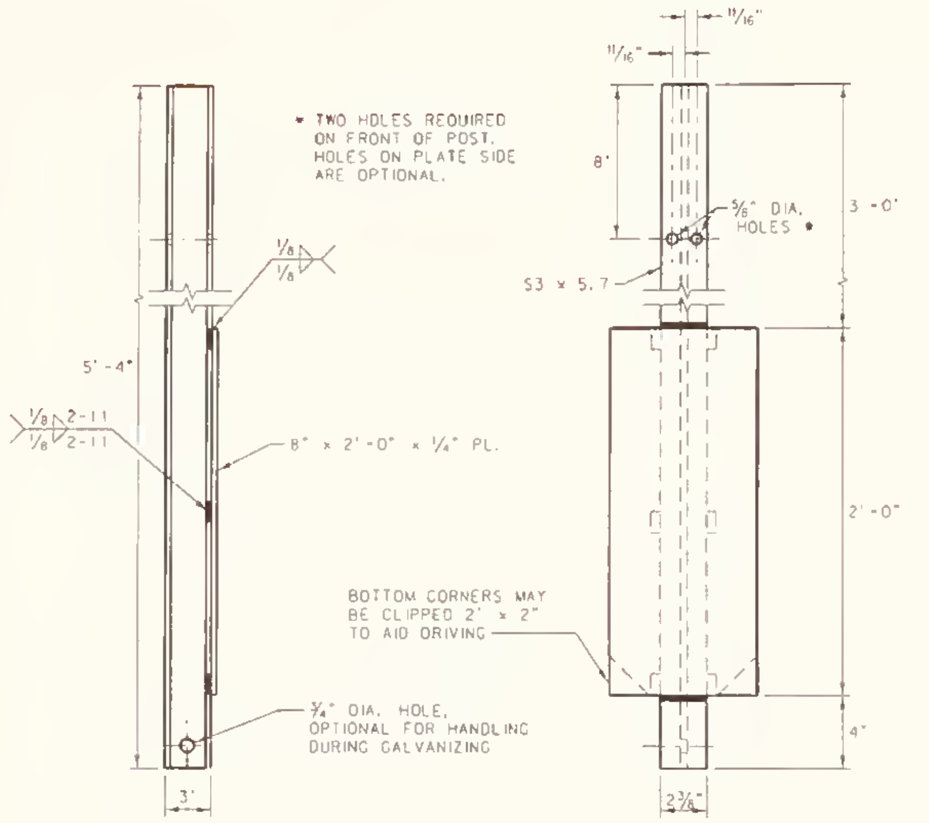
DETAIL B

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 606
DWG. NO.
606-46

INTERSECTING ROADWAY
TERMINAL SECTION

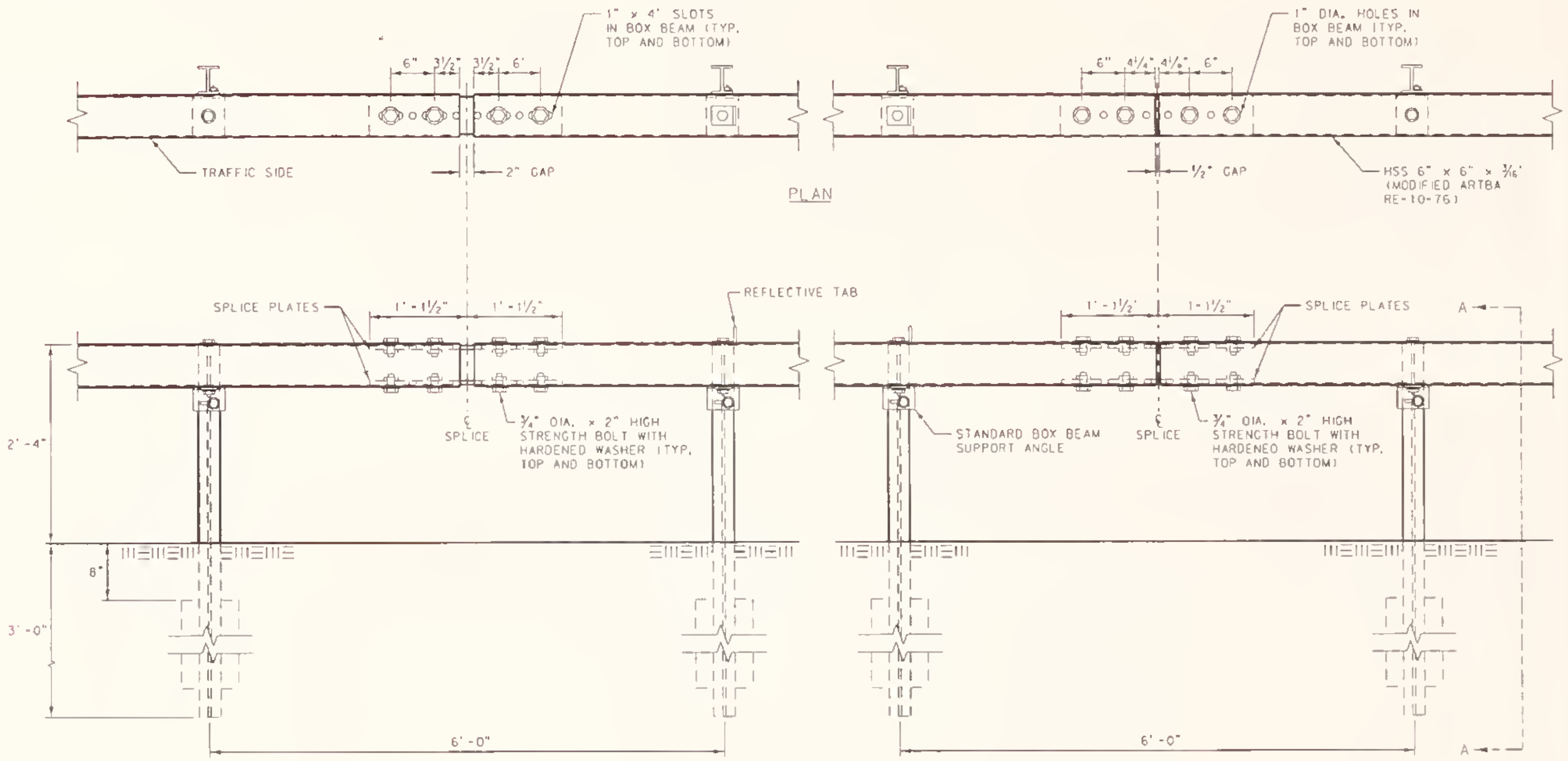
EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD


11/16"
11/16"
* TWO HOLES REQUIRED ON FRONT OF POST. HOLES ON PLATE SIDE ARE OPTIONAL.
8"
5/8" DIA. HOLES *
3'-0"
S3 × 5.7
1/8
1/8
5'-4"
1/8 2-11
1/8 2-11
8" × 2'-0" × 1/4" PL.
2'-0"
BOTTOM CORNERS MAY BE CLIPPED 2" × 2" TO AID DRIVING
3/4" DIA. HOLE, OPTIONAL FOR HANDLING DURING GALVANIZING
4"
3"
2 3/8"

STRUCTURAL SHAPE POST (STEEL)

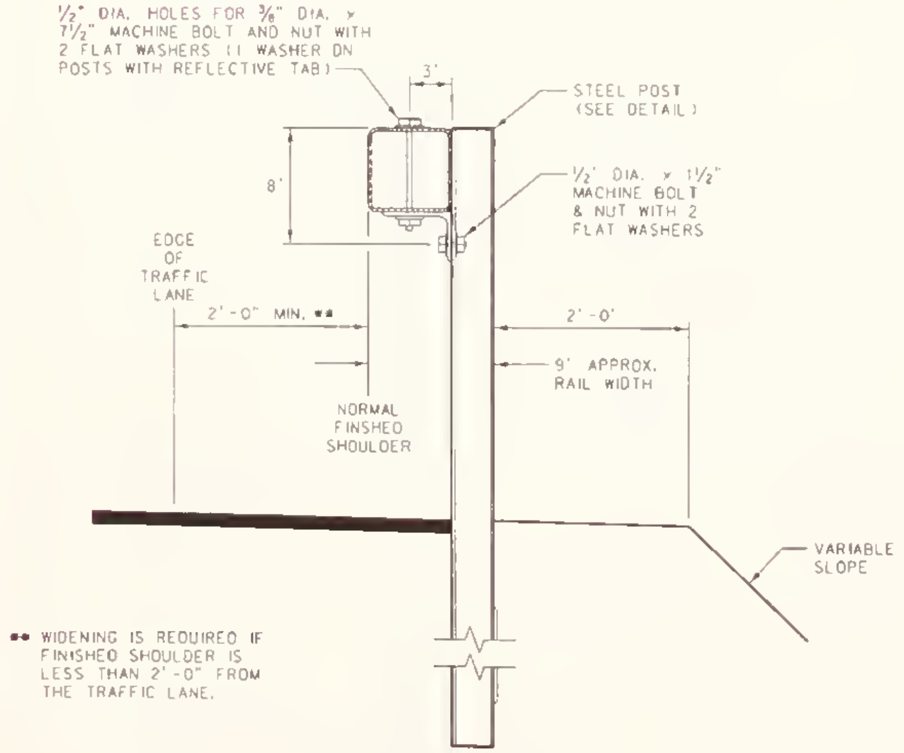
MODIFIED ARTBA P-4-76


1" × 4" SLOTS IN BOX BEAM (TYP. TOP AND BOTTOM)
6"
3 1/2"
3 1/2"
6"
TRAFFIC SIDE
2" GAP
PLAN
1" DIA. HOLES IN BOX BEAM (TYP. TOP AND BOTTOM)
6"
4 1/4"
4 1/4"
6"
1/2" GAP
HSS 6" × 6" × 3/16" (MODIFIED ARTBA RE-10-76)
SPLICE PLATES
1'-1 1/2"
1'-1 1/2"
REFLECTIVE TAB
℄ SPLICE
3/4" DIA. × 2" HIGH STRENGTH BOLT WITH HARDENED WASHER (TYP. TOP AND BOTTOM)
2'-4"
8"
3'-0"
6'-0"
1'-1 1/2"
1-1 1/2"
SPLICE PLATES
A
STANDARD BOX BEAM SUPPORT ANGLE
℄ SPLICE
3/4" DIA. × 2" HIGH STRENGTH BOLT WITH HARDENED WASHER (TYP. TOP AND BOTTOM)
6'-0"
A

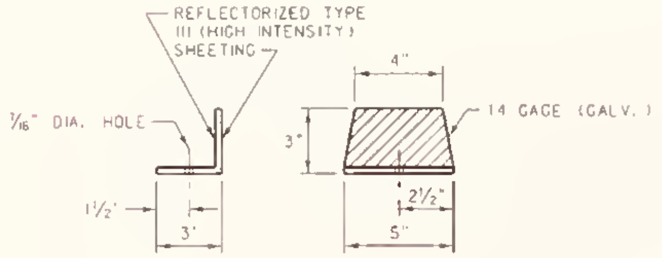
ELEVATION

EXPANSION JOINT

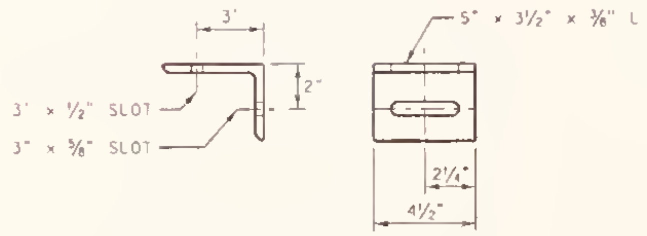
SPLICE DETAIL


1/2" DIA. HOLES FOR 3/8" DIA. × 7 1/2" MACHINE BOLT AND NUT WITH 2 FLAT WASHERS (1 WASHER ON POSTS WITH REFLECTIVE TAB)
3"
STEEL POST (SEE DETAIL)
8"
1/2" DIA. × 1 1/2" MACHINE BOLT & NUT WITH 2 FLAT WASHERS
EDGE OF TRAFFIC LANE
2'-0" MIN. **
2'-0"
9" APPROX. RAIL WIDTH
NORMAL FINSHED SHOULDER
VARIABLE SLOPE
** WIDENING IS REQUIRED IF FINISHED SHOULDER IS LESS THAN 2'-0" FROM THE TRAFFIC LANE.

SECTION A-A

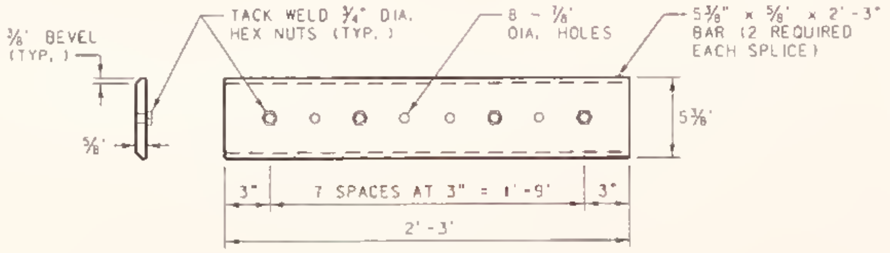


REFLECTIVE TAB



STANDARD BOX BEAM SUPPORT ANGLE

MODIFIED ARTBA P-5-76


3/8" BEVEL (TYP.)
5/8"
TACK WELD 3/4" DIA. HEX NUTS (TYP.)
8 - 7/8" DIA. HOLES
5 3/8" × 5/8" × 2'-3" BAR (2 REQUIRED EACH SPLICE)
5 3/8"
3"
7 SPACES AT 3" = 1'-9"
3"
2'-3"

SPLICE PLATE

MODIFIED ARTBA RE-11-73

NOTES:

USE RAIL IN MINIMUM NOMINAL LENGTHS OF 18 FEET UNLESS APPROVED BY THE ENGINEER.

INSTALL EXPANSION JOINTS ON ALL BOX BEAM INSTALLATIONS GREATER THAN 300' IN LENGTH AT INTERVALS NOT TO EXCEED 500'.

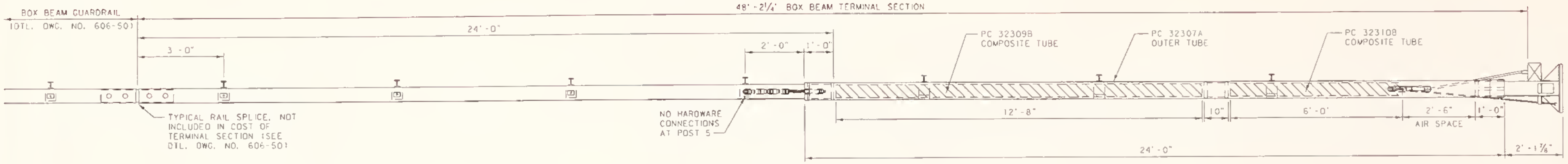
ATTACH REFLECTIVE TABS TO EVERY FOURTH POST (24 FEET TYP.).

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 606
DWG. NO.
606-50

BOX BEAM
GUARDRAIL

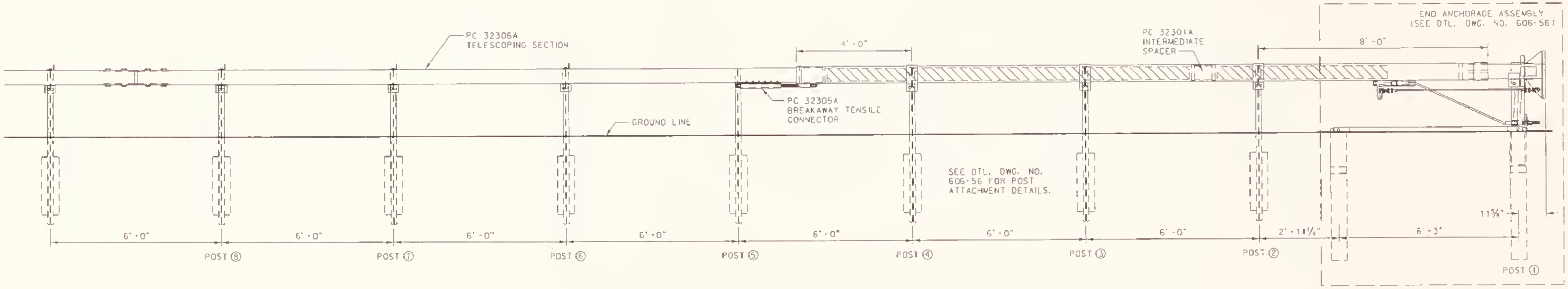
EFFECTIVE: AUGUST 1999

MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



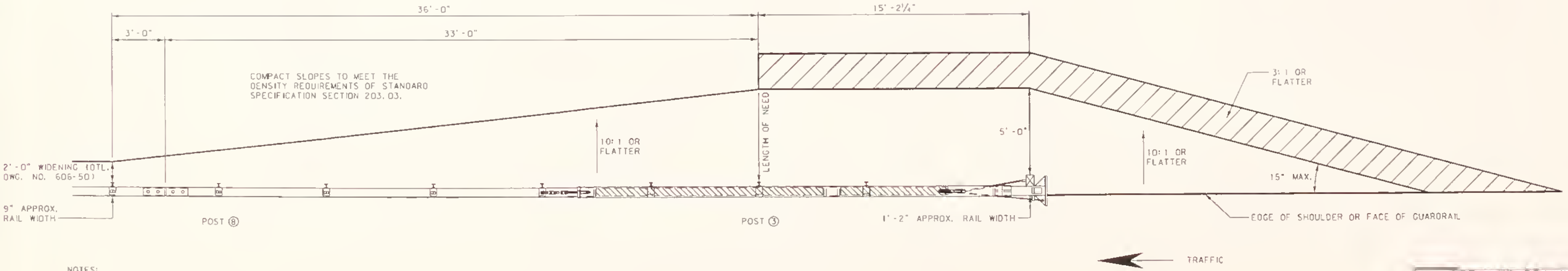
BOX BEAM GUARDRAIL (DTL. DWG. NO. 606-50)
48' - 2¼' BOX BEAM TERMINAL SECTION
24' - 0"
3' - 0"
2' - 0"
1' - 0"
PC 32309B COMPOSITE TUBE
PC 32307A OUTER TUBE
PC 32310B COMPOSITE TUBE
TYPICAL RAIL SPLICE, NOT INCLUDED IN COST OF TERMINAL SECTION (SEE DTL. DWG. NO. 606-50)
NO HARDWARE CONNECTIONS AT POST 5
12' - 8"
10"
6' - 0"
2' - 6"
1' - 0"
AIR SPACE
24' - 0"
2' - 1⅞"

PLAN



PC 32306A TELESCOPING SECTION
4' - 0"
PC 32301A INTERMEDIATE SPACER
8' - 0"
END ANCHORAGE ASSEMBLY (SEE DTL. DWG. NO. 606-56)
PC 32305A BREAKAWAY TENSILE CONNECTOR
GROUND LINE
SEE DTL. DWG. NO. 606-56 FOR POST ATTACHMENT DETAILS.
11⅝"
6' - 0"
6' - 0"
6' - 0"
6' - 0"
6' - 0"
6' - 0"
6' - 0"
2' - 11¼"
6 - 3"
POST ⑧
POST ⑦
POST ⑥
POST ⑤
POST ④
POST ③
POST ②
POST ①

ELEVATION



36' - 0"
15' - 2¼"
3' - 0"
33' - 0"
COMPACT SLOPES TO MEET THE DENSITY REQUIREMENTS OF STANDARD SPECIFICATION SECTION 203.03.
3:1 OR FLATTER
LENGTH OF NEED
10:1 OR FLATTER
5' - 0"
10:1 OR FLATTER
2' - 0" WIDENING (DTL. DWG. NO. 606-50)
15° MAX.
9" APPROX. RAIL WIDTH
POST ⑧
POST ③
1' - 2" APPROX. RAIL WIDTH
EDGE OF SHOULDER OR FACE OF GUARDRAIL
TRAFFIC

GUARDRAIL WIDENING

NOTES:

PLACE A SELF-ADHESIVE OBJECT MARKER ON THE FACE OF THE NOSE ASSEMBLY, HAVING ALTERNATING RETRO-REFLECTIVE BLACK AND YELLOW STRIPES SLOPED DOWNWARD AT AN ANGLE OF 45° TOWARDS THE SIDE ON WHICH TRAFFIC IS TO PASS.

DO NOT FLARE THE WY-BET TERMINAL SECTION.

DETAILED DRAWING

REFERENCE
STANDARD SPEC.
SECTION 606

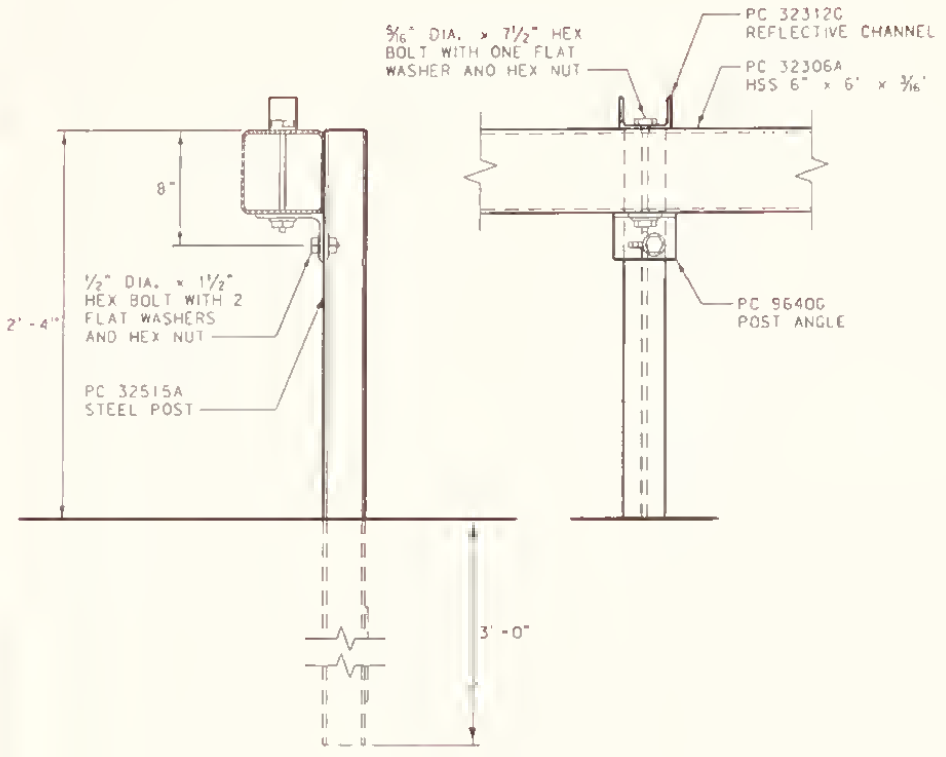
DWG. NO.
606-55

WY-BET
BOX BEAM
TERMINAL SECTION

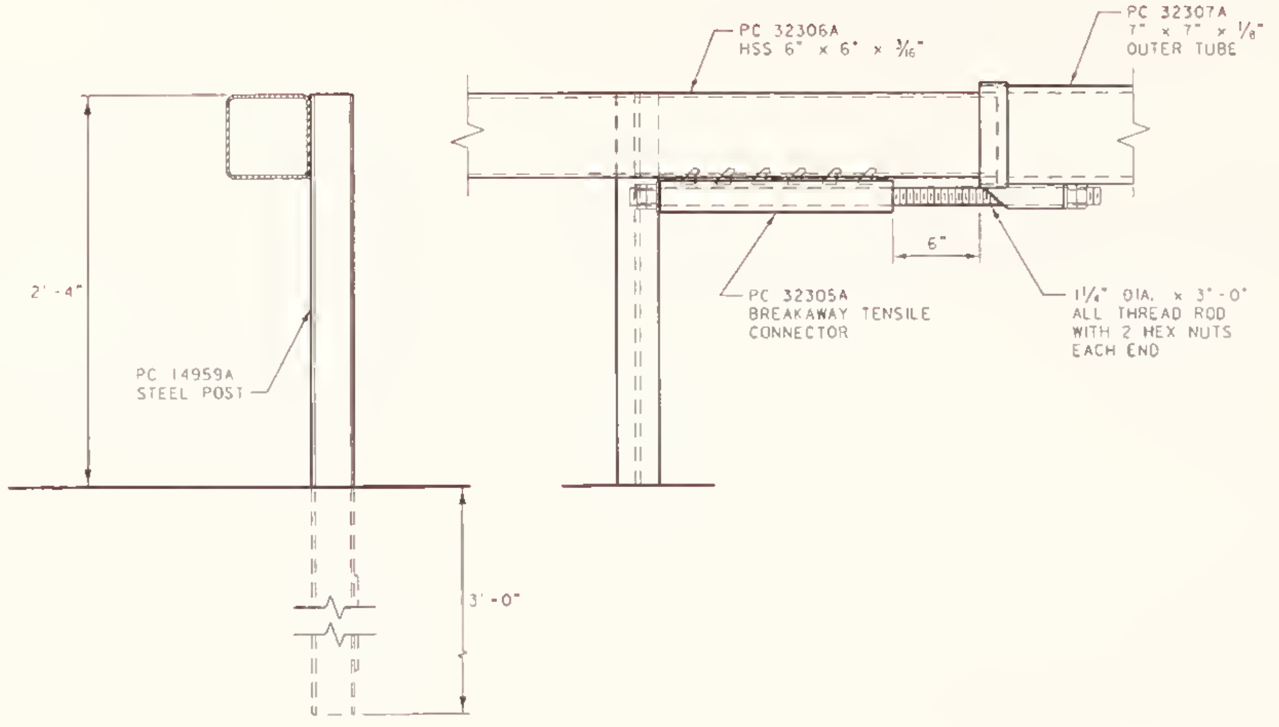
EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION

MONTANA CADD

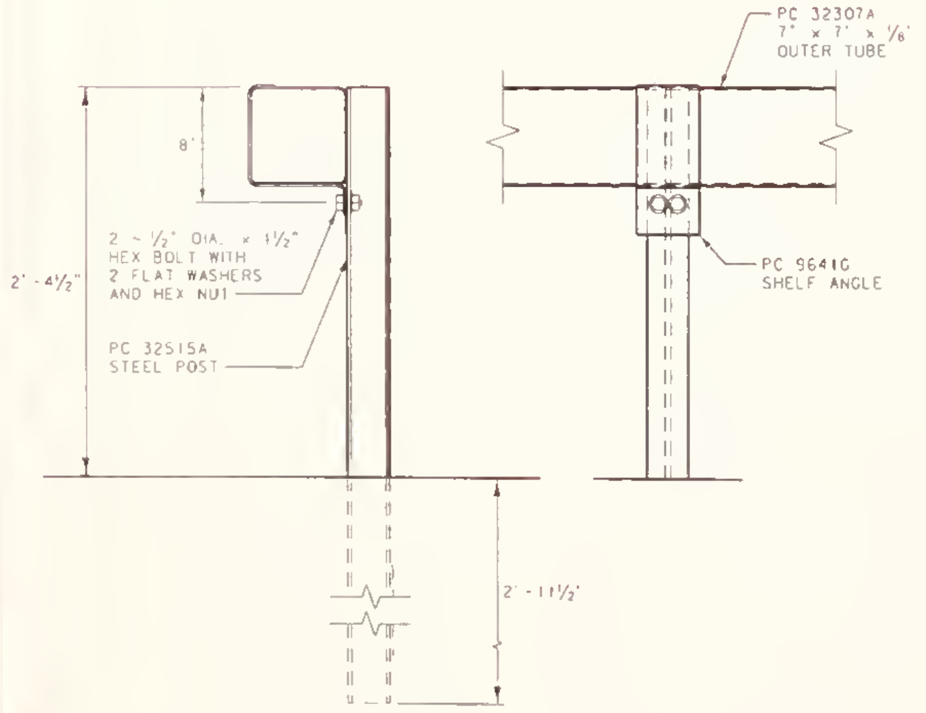

5/16" DIA. x 7 1/2" HEX BOLT WITH ONE FLAT WASHER AND HEX NUT
PC 32312G REFLECTIVE CHANNEL
PC 32306A HSS 6" x 6' x 3/16"
8"
1/2" DIA. x 1 1/2" HEX BOLT WITH 2 FLAT WASHERS AND HEX NUT
2'-4"
PC 32515A STEEL POST
PC 9640G POST ANGLE
3'-0"

POST ATTACHMENT DETAIL
(TYP. AT POSTS 6, 7 AND 8)

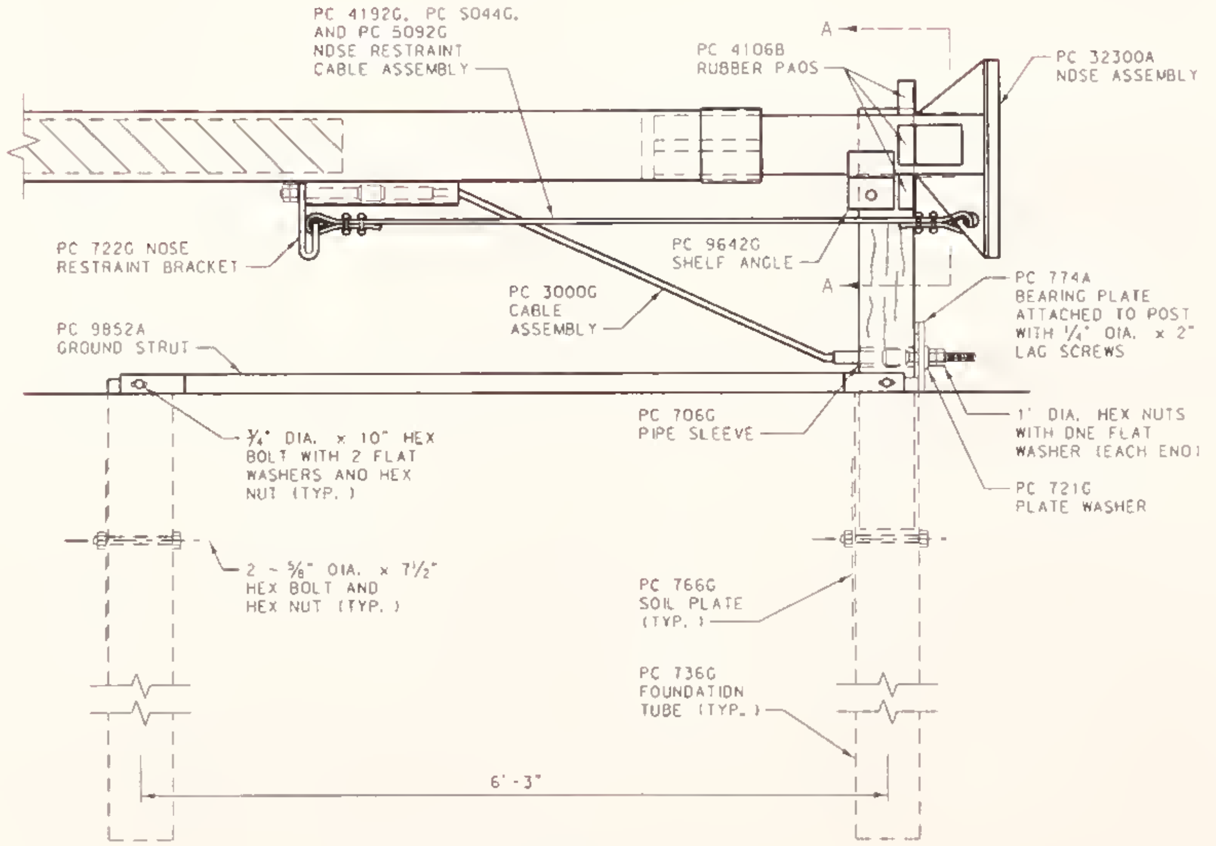

PC 32306A HSS 6" x 6" x 3/16"
PC 32307A 7" x 7" x 1/8" OUTER TUBE
2'-4"
PC 14959A STEEL POST
3'-0"
PC 32305A BREAKAWAY TENSILE CONNECTOR
6"
1 1/4" DIA. x 3'-0" ALL THREAD ROD WITH 2 HEX NUTS EACH END

POST ATTACHMENT DETAIL
(POST 5)

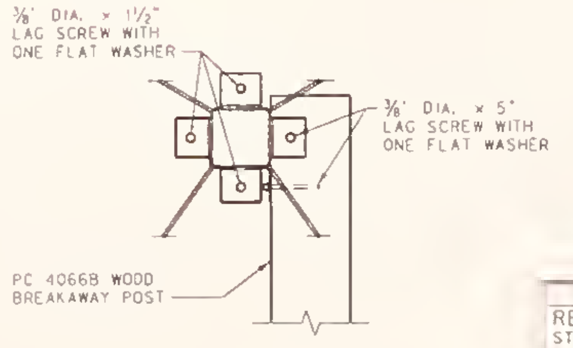
BILL OF MATERIAL		
PC	QTY	DESCRIPTION
706G	1	PIPE SLEEVE, 2" DIA. x 6'
721G	1	PLATE WASHER, 3" x 4' x 3/8"
722G	1	NOSE RESTRAINT CABLE BRACKET
736G	2	STEEL TUBE, 6' x 8" x 5'-0'
766G	2	SOIL PLATE, 18" x 24" x 1/4"
774A	1	SLOTTED BEARING PLATE
3000G	1	CABLE ASSEMBLY
3148G	2	1/4" DIA. x 2" LAG SCREW
3240G	3	5/16" DIA. ROUND WASHER
3245G	3	5/16" DIA. HEX NUT
3254G	3	3/8' DIA. x 1 1/2" LAG SCREW
3255G	5	3/8" DIA. ROUND WASHER
3264G	2	3/8" DIA. x 5" LAG SCREW
3350G	4	5/8" DIA. HEX NUT
3478G	4	5/8" DIA. x 7 1/2" HEX BOLT
3700G	4	3/4' DIA. ROUND WASHER
3710G	2	3/4' DIA. HEX NUT
4044G	4	1 1/4" DIA. HEX NUT
4066B	1	WOOD POST, 6" x 8" x 3'-6 1/2"
4106B	3	RUBBER PAD, 1 1/2" x 3 1/2' x 4"
4192G	4	1/4" CABLE CLAMP
4300G	18	1/2' DIA. ROUND WASHER
4303G	9	1/2" DIA. HEX NUT
4308G	9	1/2' DIA. x 1 1/2" HEX BOLT
4719G	2	3/4" DIA. x 10" HEX BOLT
4902G	2	1" DIA. ROUND WASHER
4903G	4	1" DIA. HEX NUT
5044G	1	AIRCRAFT CABLE, 1/4" DIA. x 6'-10"
5092G	2	1/4' AIRCRAFT CABLE THIMBLE
5188G	3	5/16" DIA. x 7 1/2" HEX BOLT
5423G	1	1 1/4" DIA. x 36" ALL THREAD ROD
9640G	3	POST ANGLE, 5' x 3 1/2" x 3/8' x 4 1/2"
9641G	3	SHELF ANGLE, 4 1/2" x 1/8" x 1'-7 1/8"
9642G	1	SHELF ANGLE, 4 1/2' x 1/8' x 11 1/8"
9852A	1	STRUT AND YOKE ASSEMBLY
14959A	1	5'-4" STEEL POST
32300A	1	WY-BET NOSE ASSEMBLY
32301A	1	HSS 6" x 6' x 10" INTERMEDIATE SPACER
32305A	1	BREAKAWAY TENSILE CONNECTOR
32306A	1	HSS 6" x 6' x 3/16" TELESCOPING SECTION
32307A	1	OUTER TUBE
32309B	1	6' O.D. x 1/4' x 12'-7 7/8" COMPOSITE TUBE
32310B	1	6" O.D. x 1/8' x 5'-11 7/8" COMPOSITE TUBE
32312G	3	REFLECTOR CHANNEL
32515A	6	5'-4" STEEL POST


PC 32307A 7" x 7" x 1/8" OUTER TUBE
8"
2'-4 1/2"
2 ~ 1/2" DIA. x 1 1/2" HEX BOLT WITH 2 FLAT WASHERS AND HEX NUT
PC 32515A STEEL POST
PC 9641G SHELF ANGLE
2'-11 1/2"

POST ATTACHMENT DETAIL
(TYP. AT POSTS 2, 3 AND 4)


PC 4192G, PC 5044G, AND PC 5092G NOSE RESTRAINT CABLE ASSEMBLY
PC 4106B RUBBER PADS
A
PC 32300A NOSE ASSEMBLY
PC 722G NOSE RESTRAINT BRACKET
PC 9642G SHELF ANGLE
A
PC 3000G CABLE ASSEMBLY
PC 774A BEARING PLATE ATTACHED TO POST WITH 1/4" DIA. x 2" LAG SCREWS
PC 9852A GROUND STRUT
3/4" DIA. x 10" HEX BOLT WITH 2 FLAT WASHERS AND HEX NUT (TYP.)
PC 706G PIPE SLEEVE
1" DIA. HEX NUTS WITH ONE FLAT WASHER (EACH END)
PC 721G PLATE WASHER
2 ~ 5/8" DIA. x 7 1/2" HEX BOLT AND HEX NUT (TYP.)
PC 766G SOIL PLATE (TYP.)
PC 736G FOUNDATION TUBE (TYP.)
6'-3"

END ANCHORAGE ASSEMBLY


3/8' DIA. x 1 1/2" LAG SCREW WITH ONE FLAT WASHER
3/8' DIA. x 5" LAG SCREW WITH ONE FLAT WASHER
PC 4066B WOOD BREAKAWAY POST

SECTION A-A

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 606
DWG. NO.
606-56

WY-BET BOX
BEAM TERMINAL
SECTION DETAILS

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

SCHEDULE OF HARDWARE *

DESIGNATION	DESCRIPTION	DTL. DWG. NO.
F-1-76	5/16" DIA. HOOK BOLTS	606-82
F-3( )-76	5/8" DIA. BUTTONHEAD BOLT AND NUT	606-82
F-8-76	5/8" DIA. HEX BOLT AND NUT	606-82
F-10( )-79	3/4" DIA. HEX BOLT AND NUT	606-82
F-12-73	RECTANGULAR PLATE WASHER	606-84
F-13-73	STEEL WASHER FOR 5/8" DIA. BOLT	606-84
F-34-76	PIPE SLEEVE	606-84
F-35-76	STEEL WASHER AND NUT FOR 1" DIA. BOLT	606-84
F-37-76	CABLE ASSEMBLY	606-86
F-38-79	END PLATE	606-84
P-1-76	STRUCTURAL SHAPE LINE POST (STEEL)	606-92
P-2-79	END POST FITTINGS	606-90
P-46-76	BENT PLATE LINE POST (STEEL)	606-92
RE-1-76	3/4" DIA. WIRE ROPE (3 × 7)	606-94
RE-3-73	W-BEAM	606-88
RE-5-76	W-BEAM END SECTION (FLARED)	606-88
RE-7(24')-79	W-BEAM END SECTION (BUFFER)	606-88
RE-8-79	W-BEAM TERMINAL CONNECTOR	606-88
RE-71-79	ANCHOR PLATE	606-86

* SEE ARTBA TECHNICAL BULLETIN NO. 268-B (AGC STANDARD FORM NO. 131) "A GUIDE TO STANDARDIZED HIGHWAY BARRIER RAIL HARDWARE."

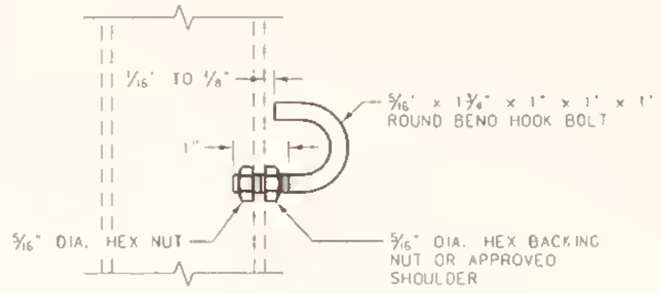
DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 606
DWG. NO.
606-80

SCHEDULE OF
GUARDRAIL HARDWARE

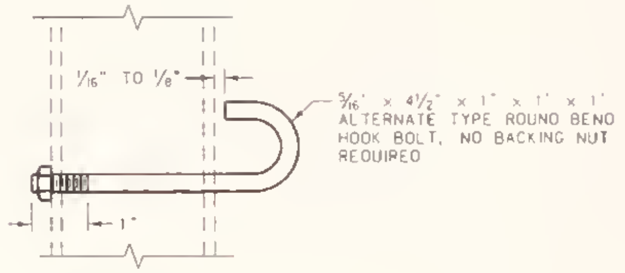
EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

NOTE:
NUTS ARE OF THE HEAVY HEX TYPES. INSTALL BOLTS TO DEVELOP AN ULTIMATE PULL OPEN STRENGTH FROM 500 POUNDS TO 1000 POUNDS APPLIED IN A DIRECTION NORMAL TO THE LONGITUDINAL AXIS OF THE POST.

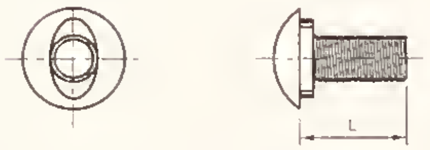


5/16" DIA. HOOK BOLT


1/16" TO 1/8"
5/16" × 4 1/2" × 1" × 1" × 1"
ALTERNATE TYPE ROUND BEND HOOK BOLT, NO BACKING NUT REQUIRED
1"

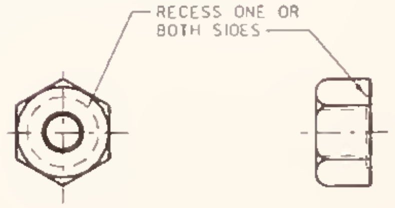
ALTERNATE 5/16" DIA. HOOK BOLT

F-1-76



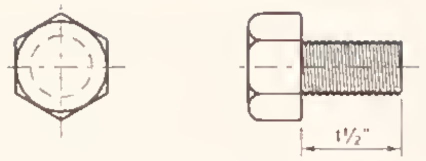
5/8" DIA. OVAL SHOULDERED BUTTONHEAD BOLT

L	THREAD LENGTH
1 1/4"	FULL
2"	1 1/2" MIN.
9 1/2"	1 3/4" MIN.
18"	2 1/2" MIN.
25"	2" MIN.

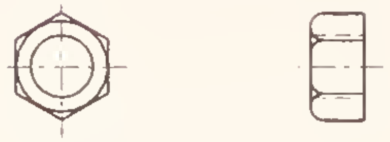


5/8" DIA. RECESS NUT

F-3( )-76

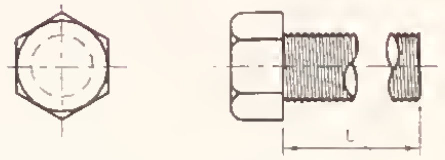


5/8" DIA. HEX BOLT



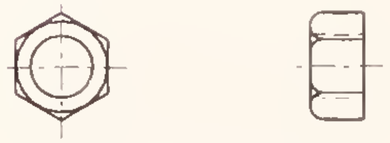
5/8" DIA. HEX NUT

F-8-76

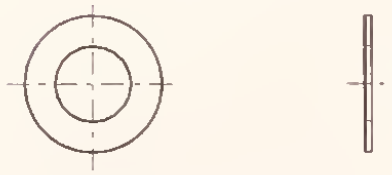


3/4" DIA. HEX BOLT

L	THREAD LENGTH
1 1/2"	FULL
4 1/2"	2"
7 1/2"	2"
9 1/2"	2"



3/4" DIA. HEX NUT



STEEL WASHER FOR 3/4" DIA. BOLT

F-10( )-79

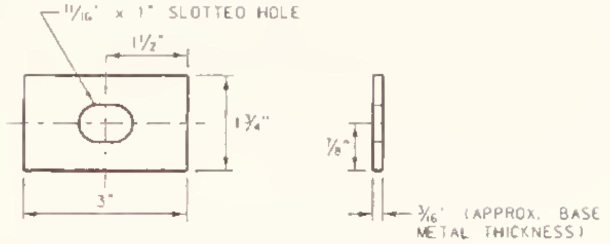
DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 606
DWG. NO.
606-82

GUARDRAIL HARDWARE

EFFECTIVE: AUGUST 1999

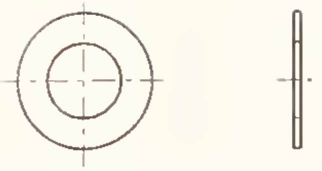
MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

NOTE:
CONFORM WASHER TO THE REQUIREMENTS OF AASHTO M 180.



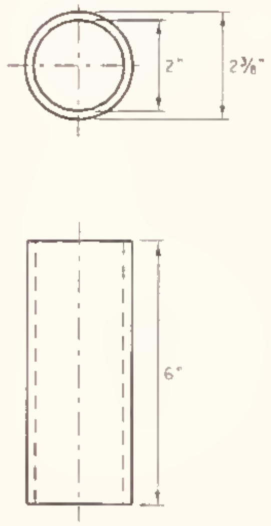
RECTANGULAR PLATE WASHER

F-12-73



STEEL WASHER FOR 5/8" DIA. BOLT

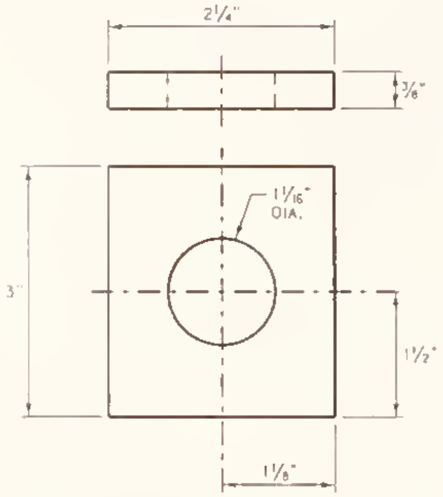
F-13-73



NOTE:
SLEEVE CONSISTS OF 2" DIA. GALVANIZED STANDARD PIPE, CONFORMING TO THE REQUIREMENTS OF ASTM A 53.

POST SLEEVE

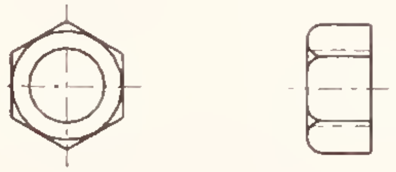
F-34-76



NOTE:
END PLATES ARE TO CONFORM TO THE REQUIREMENTS OF ASTM A 36 AND BE GALVANIZED IN ACCORDANCE WITH AASHTO M 111 (ASTM A 123).

END PLATE

F-38-79

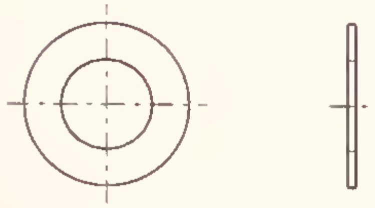


1" DIA. HEX NUT

NOTE:

NUTS ARE TO CONFORM TO THE REQUIREMENTS OF ASTM A 325 AND WASHERS ARE TO BE MADE OF STEEL; GALVANIZE BOTH IN ACCORDANCE WITH AASHTO M 232 (ASTM A 153). AFTER GALVANIZING, THE PITCH DIAMETER OF THE NUT MAY BE TAPPED 0.023" OVER THE ANSI CLASS 2B TOLERANCE.

WASHERS ARE TO MEET THE DIMENSIONAL REQUIREMENTS OF ANSI B27.2 TYPE A PLAIN WASHERS. NO PUNCHING, DRILLING OR CUTTING IS PERMITTED AFTER GALVANIZING.



STEEL WASHER FOR 1" DIA. BOLT

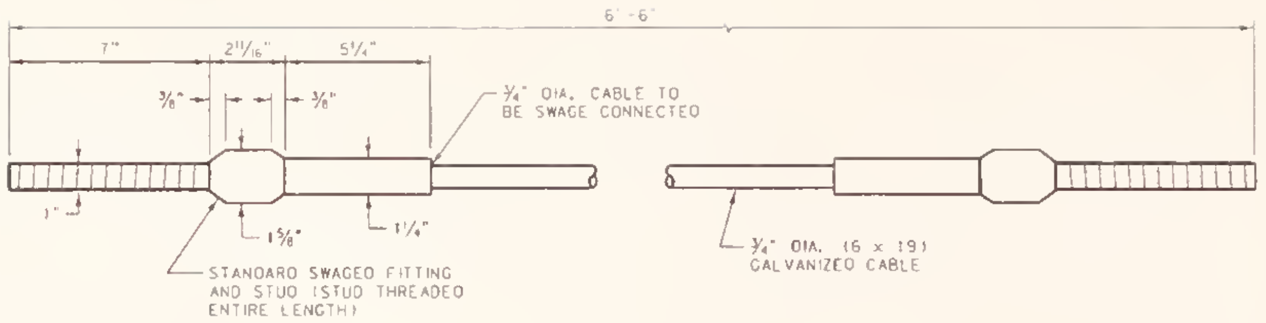
F-35-76

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 606
DWG. NO.
606-84

GUARDRAIL HARDWARE

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT
OF TRANSPORTATION
MONTANA
CADD


6'-6"
7"
2 11/16"
5 1/4"
3/8"
3/8"
3/4" DIA. CABLE TO BE SWAGE CONNECTED
1"
1 5/8"
1 1/4"
STANDARD SWAGED FITTING AND STUD (STUD THREADED ENTIRE LENGTH)
3/4" DIA. (6 x 19) GALVANIZED CABLE

NOTES:

FOR RELATED FASTENER HARDWARE SEE F-35-76 AND F-38-79.

MACHINE THE SWAGED FITTING FROM HOT-ROLLED CARBON STEEL, CONFORMING TO THE REQUIREMENTS OF ASTM A 576, GRADE 1035, AND ANNEAL SUITABLE FOR COLD SWAGING. GALVANIZE THE SWAGED FITTING IN ACCORDANCE WITH ASTM A 123 BEFORE SWAGING. DRILL A LOCK PIN HOLE TO ACCOMMODATE A 1/4", PLATED SPRING STEEL PIN THROUGH THE HEAD OF THE SWAGED FITTING TO RETAIN THE STUD IN THE PROPER POSITION. AFTER GALVANIZING THE HEAD MAY BE TAPPED 0.023" OVER THE ANSI CLASS 2B TOLERANCE.

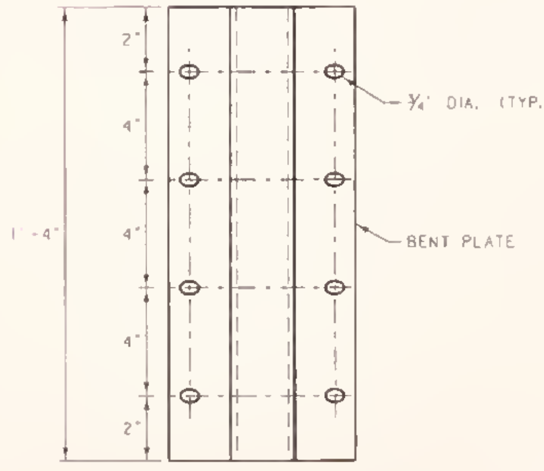
THE STUD IS TO CONFORM TO THE REQUIREMENTS OF ASTM A 449 AND BE GALVANIZED IN ACCORDANCE WITH ASTM A 153. THE THREADS MUST HAVE A CLASS 2A FIT BEFORE GALVANIZING. PRIOR TO GALVANIZING, MILL A 3/8" SLOT INTO THE STUD END FOR THE LOCKING PIN.

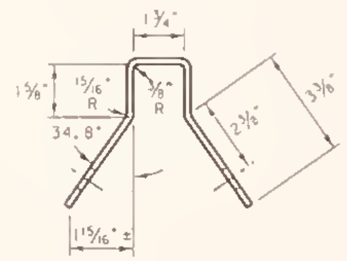
WIRE ROPE IS TO CONFORM TO THE REQUIREMENTS OF AASHTO M 30 AND BE 3/4" PREFORMED, 6 x 19, WIRE STRAND CORE OR INDEPENDENT WIRE ROPE CORE (IWRC), GALVANIZED, RIGHT REGULAR LAY, MANUFACTURED OF IMPROVED PLOW STEEL WITH A MINIMUM BREAKING STRENGTH OF 42,800 POUNDS.

THE SWAGED FITTING, STUD AND NUT (F-35-76) MUST DEVELOP THE BREAKING STRENGTH OF THE WIRE ROPE.

CABLE ASSEMBLY

F-37-76





NOTES:

ANCHOR PLATES ARE TO CONFORM TO THE REQUIREMENTS OF AASHTO M 183 (ASTM A 36) AND BE GALVANIZED IN ACCORDANCE WITH AASHTO M 111 (ASTM A 123).

NO PUNCHING, DRILLING OR CUTTING IS PERMITTED AFTER GALVANIZING.

ANCHOR PLATE

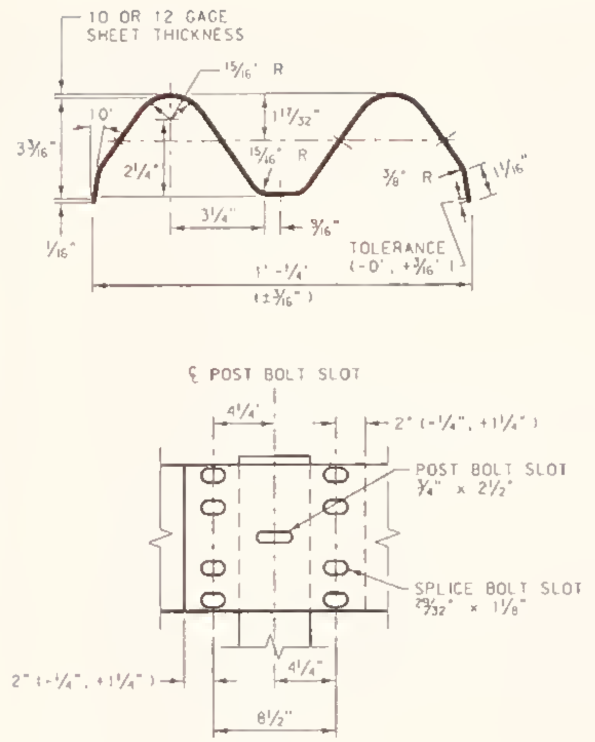
RE-71-79

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 606
DWG. NO.
606-86

GUARDRAIL HARDWARE

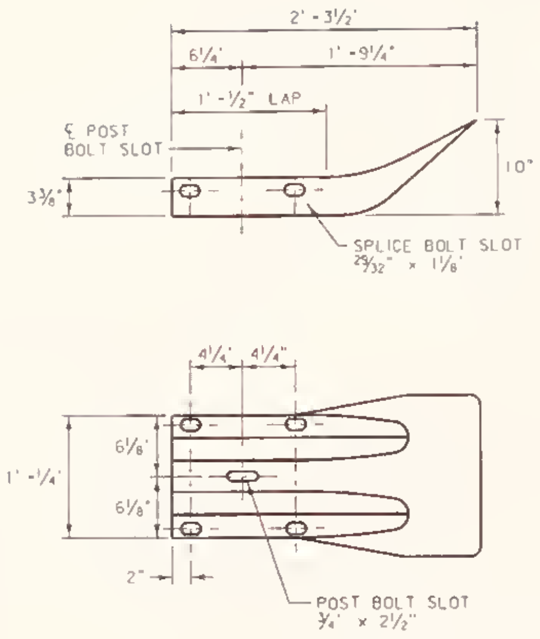
EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT
OF TRANSPORTATION
MONTANA
CADD



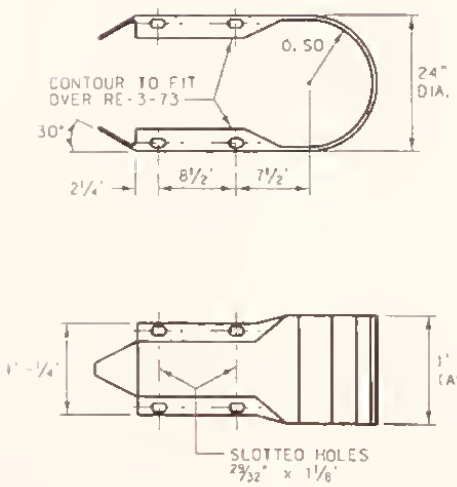
W-BEAM

RE-3-73



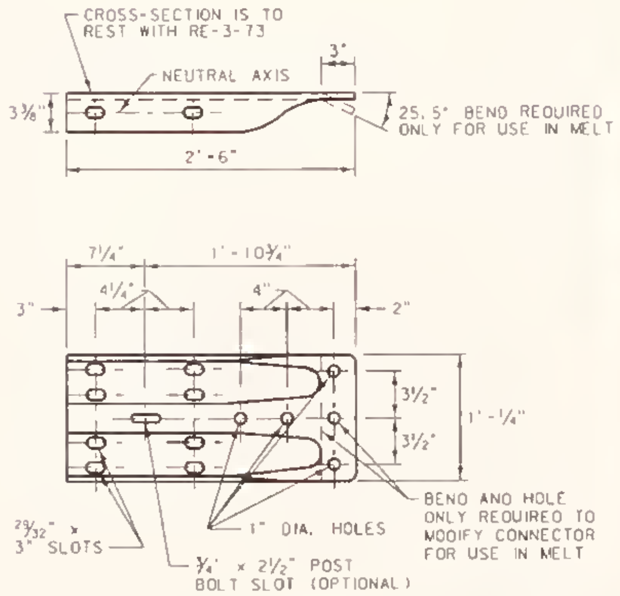
W-BEAM END SECTION (FLARED)

RE-5-76



W-BEAM END SECTION (BUFFER)

RE-7(24")-79


CROSS-SECTION IS TO REST WITH RE-3-73
NEUTRAL AXIS
3"
3 3/8"
25.5° BEND REQUIRED ONLY FOR USE IN MELT
2'-6"
7 1/4"
1'-10 3/4"
4 1/4"
4"
3"
2"
3 1/2"
3 1/2"
1'-1/4"
BEND AND HOLE ONLY REQUIRED TO MODIFY CONNECTOR FOR USE IN MELT
1" DIA. HOLES
29/32" × 3" SLOTS
3/4" × 2 1/2" POST BOLT SLOT (OPTIONAL)

W-BEAM TERMINAL CONNECTOR

RE-8-79

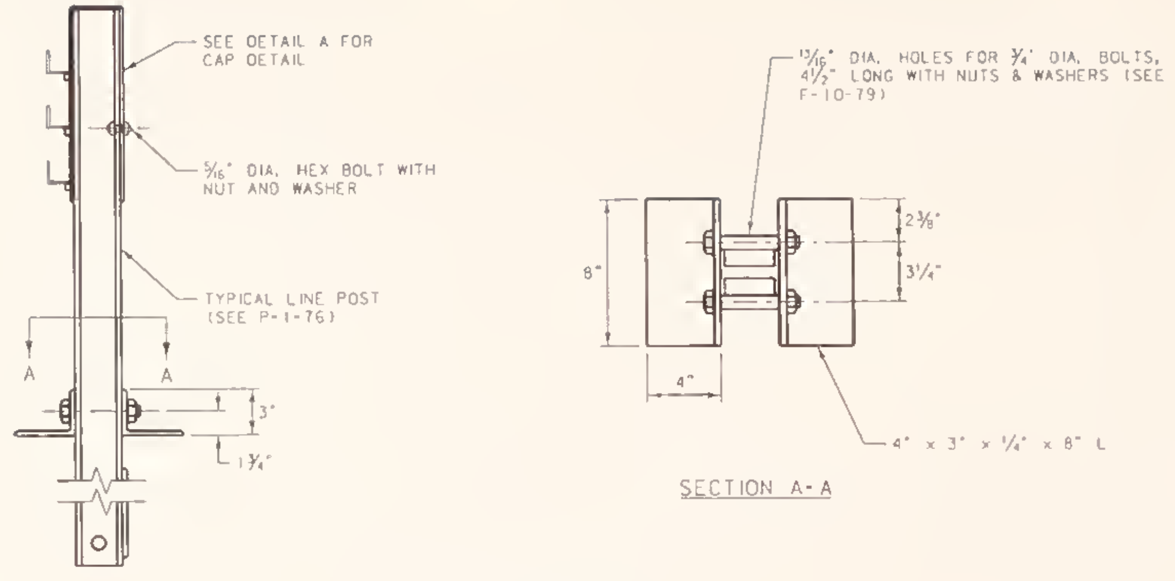
DETAILED DRAWING

REFERENCE STANDARD SPEC. SECTION 606	DWG. NO. 606-88

GUARDRAIL HARDWARE

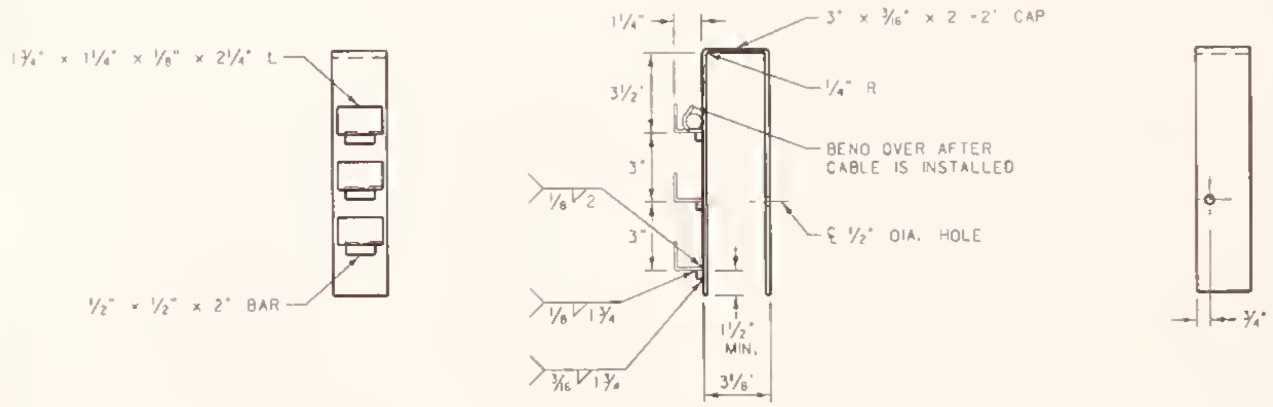
EFFECTIVE: AUGUST 1999

MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD


SEE DETAIL A FOR CAP DETAIL
5/16" DIA. HEX BOLT WITH NUT AND WASHER
TYPICAL LINE POST (SEE P-1-76)
A
A
3"
1 3/4"
13/16" DIA. HOLES FOR 3/4" DIA. BOLTS, 4 1/2" LONG WITH NUTS & WASHERS (SEE F-10-79)
2 3/8"
8"
3 1/4"
4"
4" × 3" × 1/4" × 8" L

SECTION A-A

FITTINGS ON END POST



DETAIL A

END POST FITTINGS

P-2-79

NOTES:

ANGLES AND PLATES ARE TO CONFORM TO AASHTO M 183 (ASTM A 36) AND BE GALVANIZED IN ACCORDANCE WITH AASHTO M 111 (ASTM A 123).

BOLTS AND NUTS ARE TO CONFORM TO THE REQUIREMENTS OF ASTM A 307 AND A 563, CLASS A OR BETTER, RESPECTIVELY. WASHERS ARE MADE OF STEEL, MEETING THE DIMENSIONAL REQUIREMENTS OF ANSI B27.2 TYPE A NARROW WASHER. GALVANIZE BOLTS, NUTS AND WASHERS IN ACCORDANCE WITH ASTM A 153.

WELDING IS TO CONFORM TO THE CURRENT REQUIREMENTS OF THE AMERICAN WELDING SOCIETY STRUCTURAL WELDING CODE, A.W.S. D1.1.

NO PUNCHING, DRILLING, CUTTING OR WELDING IS PERMITTED AFTER GALVANIZING.

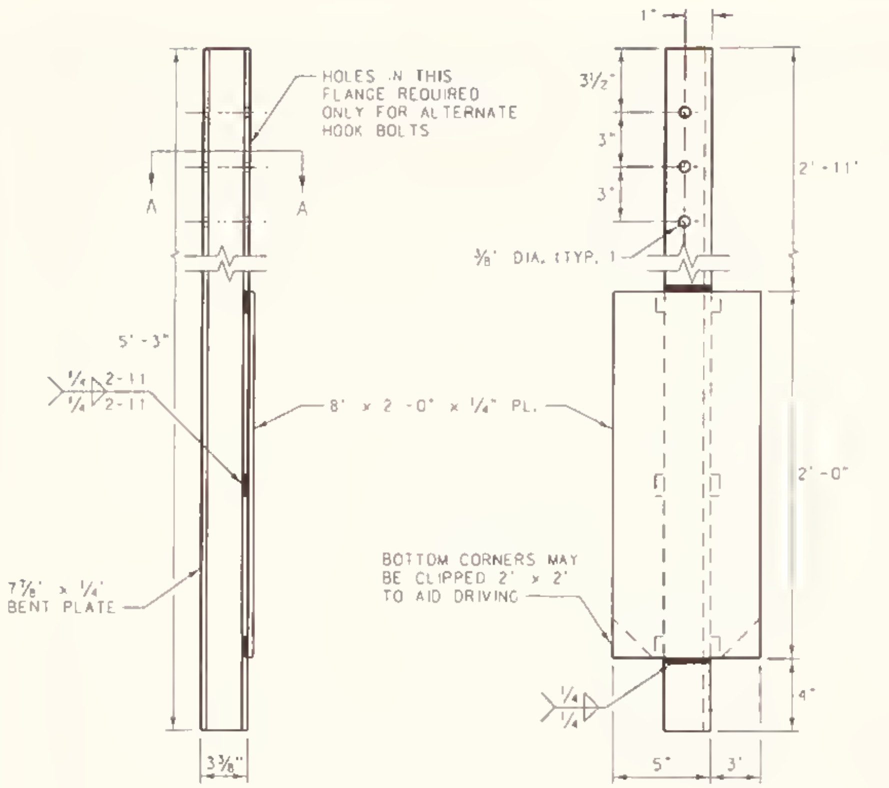
DETAILED DRAWING

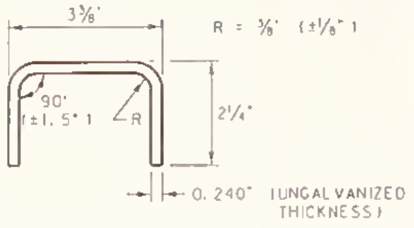
REFERENCE STANDARD SPEC. SECTION 606	DWG. NO. 606-90

CABLE GUARDRAIL HARDWARE

EFFECTIVE: AUGUST 1999

MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD





SECTION A-A

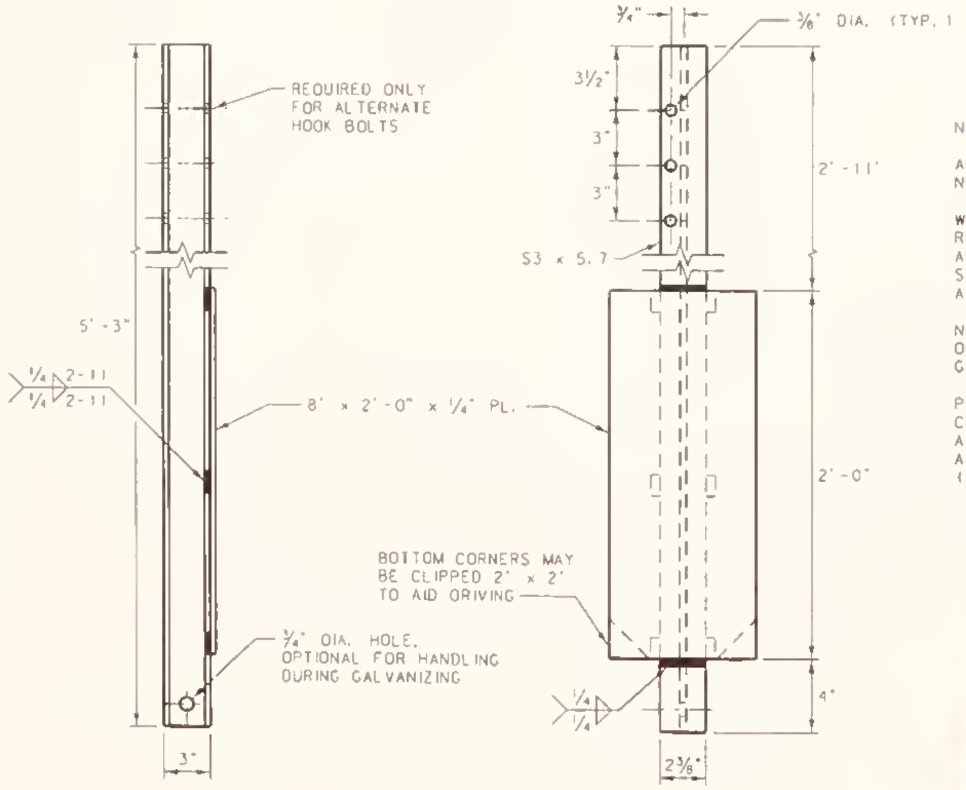
NOTES:

POSTS AND POST PLATES ARE TO CONFORM TO THE MECHANICAL REQUIREMENTS OF AASHTO M 183 (ASTM A 36) AND BE WELDED TO MEET THE CURRENT REQUIREMENTS OF THE AMERICAN WELDING SOCIETY STRUCTURAL WELDING CODE, A.W.S. D1.1. GALVANIZE FABRICATED POSTS IN ACCORDANCE WITH AASHTO M 111 (ASTM A 123).

NO PUNCHING, DRILLING, CUTTING OR WELDING IS PERMITTED AFTER GALVANIZING.

BENT PLATE LINE POST (STEEL)

P-46-76


3/4"
3/8" DIA. (TYP.)
REQUIRED ONLY FOR ALTERNATE HOOK BOLTS
3 1/2"
3"
3"
2'-11"
S3 x 5.7
5'-3"
1/4 2-11
1/4 2-11
8" x 2'-0" x 1/4" PL.
2'-0"
BOTTOM CORNERS MAY BE CLIPPED 2" x 2" TO AID DRIVING
3/4" DIA. HOLE, OPTIONAL FOR HANDLING DURING GALVANIZING
1/4
1/4
4"
3"
2 3/8"

NOTES:

ALL HOLES ARE 3/8" EXCEPT AS NOTED.

WELDING IS TO CONFORM TO THE REQUIREMENTS OF THE CURRENT AMERICAN WELDING SOCIETY STRUCTURAL WELDING CODE, A.W.S. D1.1.

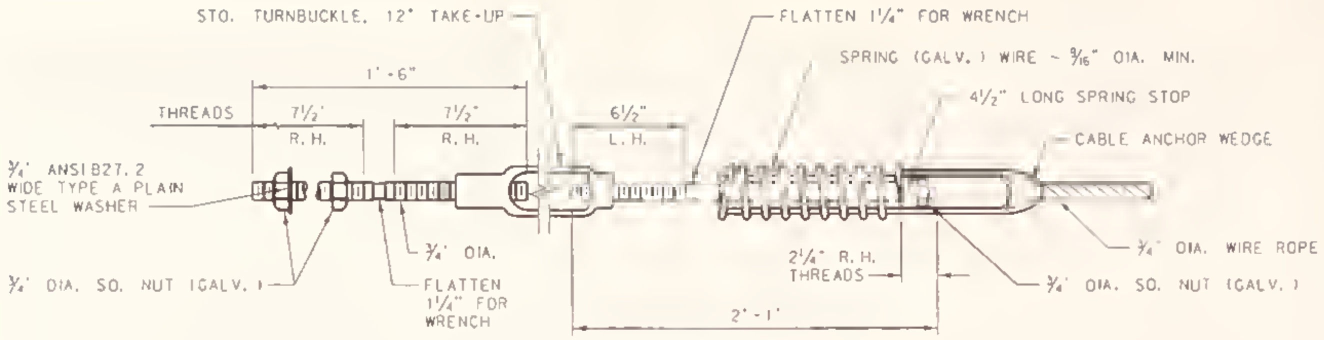
NO PUNCHING, DRILLING, CUTTING OR WELDING IS PERMITTED AFTER GALVANIZING.

POSTS AND POST PLATES ARE TO CONFORM TO AASHTO M 183 (ASTM A 36) AND BE GALVANIZED IN ACCORDANCE WITH AASHTO M 111 (ASTM A 123).

STRUCTURAL SHAPE LINE POST (STEEL)

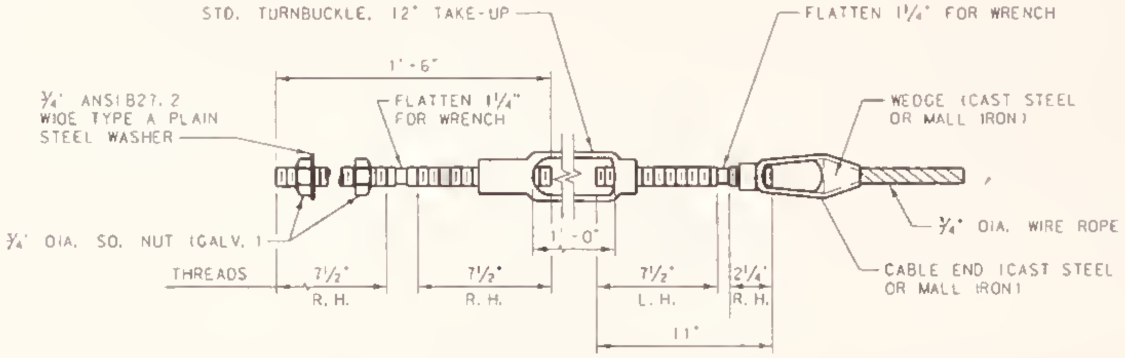
P-1-76

DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 606	DWG. NO. 606-92
CABLE GUARDRAIL HARDWARE	
EFFECTIVE: AUGUST 1999	
MONTANA DEPARTMENT OF TRANSPORTATION	MONTANA CADD

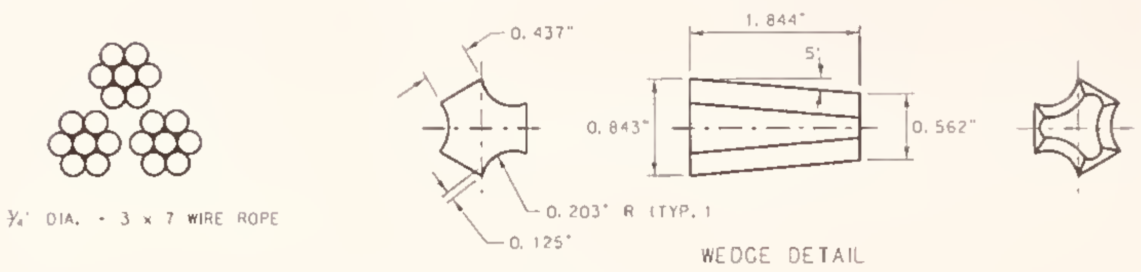

STD. TURNBUCKLE, 12" TAKE-UP
FLATTEN 1 1/4" FOR WRENCH
SPRING (GALV.) WIRE ~ 9/16" DIA. MIN.
4 1/2" LONG SPRING STOP
CABLE ANCHOR WEDGE
1'-6"
THREADS
7 1/2" R.H.
7 1/2" R.H.
6 1/2" L.H.
3/4" ANSI B27.2 WIDE TYPE A PLAIN STEEL WASHER
3/4" DIA.
FLATTEN 1 1/4" FOR WRENCH
2 1/4" R.H. THREADS
3/4" DIA. WIRE ROPE
3/4" DIA. SQ. NUT (GALV.)
3/4" DIA. SQ. NUT (GALV.)
2'-1"

R.H. = RIGHT HAND
L.H. = LEFT HAND

COMPENSATING CABLE END ASSEMBLY


STD. TURNBUCKLE, 12" TAKE-UP
FLATTEN 1 1/4" FOR WRENCH
1'-6"
3/4" ANSI B27.2 WIDE TYPE A PLAIN STEEL WASHER
FLATTEN 1 1/4" FOR WRENCH
WEDGE (CAST STEEL OR MALL IRON)
3/4" DIA. WIRE ROPE
3/4" DIA. SQ. NUT (GALV.)
1'-0"
CABLE END (CAST STEEL OR MALL IRON)
THREADS
7 1/2" R.H.
7 1/2" R.H.
7 1/2" L.H.
2 1/4" R.H.
11"

TURNBUCKLE CABLE END ASSEMBLY



3/4" DIA. WIRE ROPE

RE-1-76

NOTES:

WIRE ROPE AND CONNECTING HARDWARE ARE TO CONFORM TO THE REQUIREMENTS OF AASHTO M 30 CLASS A, 3/4" ROPE. CONNECTING HARDWARE MUST DEVELOP THE FULL STRENGTH OF A SINGLE CABLE (25,000 LB.). CAST STEEL COMPONENTS ARE TO CONFORM TO THE REQUIREMENTS OF AASHTO M 103 (ASTM A 27). MALLEABLE IRON CASTINGS ARE TO CONFORM TO THE REQUIREMENTS OF ASTM A 47.

AT ALL LOCATIONS WHERE THE CABLE IS CONNECTED TO A CABLE SOCKET WITH A WEDGE TYPE CONNECTION, CRIMP ONE WIRE OF THE WIRE ROPE OVER THE BASE OF THE WEDGE TO HOLD IT FIRMLY IN PLACE.

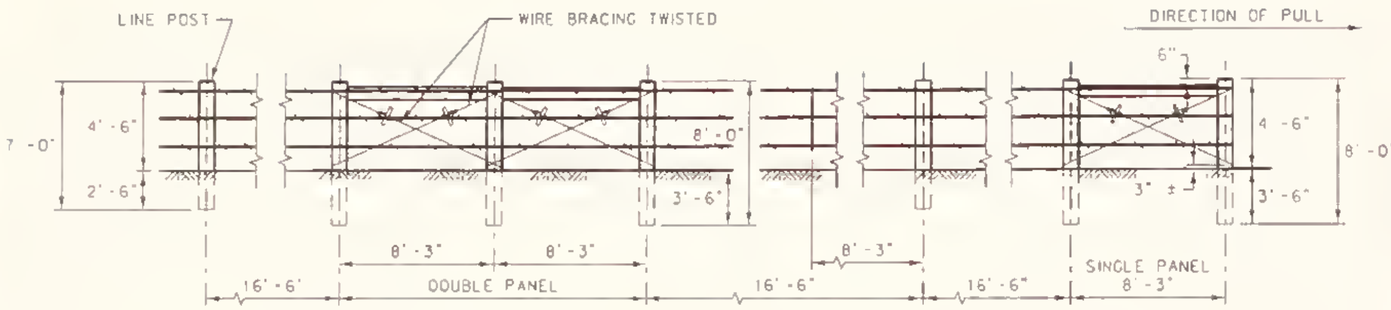
COMPENSATING DEVICES ARE TO HAVE SPRING CONSTANTS OF 450 POUNDS PER INCH, PLUS OR MINUS 50 POUNDS PER INCH, AND PERMIT A TRAVEL OF 6 INCHES PLUS OR MINUS 1 INCH.

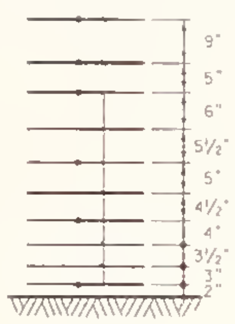
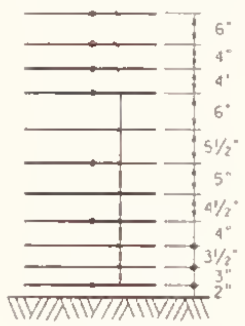
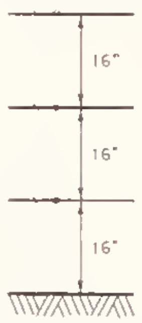
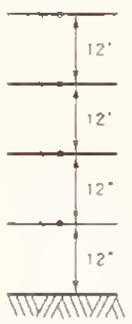
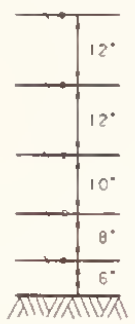
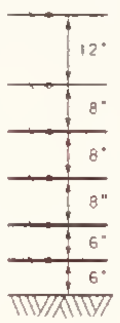
DESIGN SOCKET BASKETS FOR USE WITH THE WEDGE DETAILED IN THIS DRAWING.

ALTERNATE HARDWARE DESIGNS WILL BE CONSIDERED FOR APPROVAL PROVIDED THEIR CONNECTION DETAILS, FOR THE PURPOSE OF MAINTENANCE SUBSTITUTIONS, ARE COMPATIBLE WITH THE DETAILS OF THIS DRAWING AND THEIR OPERATING CHARACTERISTICS ARE SIMILAR TO THOSE OF THE HARDWARE IN THIS DRAWING.

THREADS OF EXTERNALLY THREADED PARTS ARE TO BE UNC, CLASS 2A TOLERANCE (ANSI B1.1). INTERNALLY THREADED PARTS ARE TO MEET THE DIMENSIONAL REQUIREMENTS OF ASTM A 563.

DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 606	DWG. NO. 606-94
CABLE GUARDRAIL HARDWARE	
EFFECTIVE: AUGUST 1999	
MONTANA DEPARTMENT OF TRANSPORTATION	MONTANA CADD



WIRE SPACING TABLE						
COMBINATION WOVEN WIRE & BARBED WIRE FENCE		BARBED WIRE FENCE				
48" FENCE HEIGHT		48' FENCE HEIGHT				
32" WW-2 BW *	32" WW-3 BW *	3 BW	4 BW	5 BW	6 BW	
TYPE F2-32WW	TYPE F3-32WW	TYPE F3	TYPE F4	TYPE F5	TYPE F6	
 9" 5" 6" 5½" 5" 4½" 4" 3½" 3" 2"	 6" 4" 4' 6" 5½" 5" 4½" 4" 3½" 3" 2"	 16" 16" 16"	 12' 12' 12" 12"	 12" 12" 10" 8" 6"	 12" 8" 8" 8" 6" 6"	

APPROXIMATE WEIGHT OF 32" WOVEN WIRE FABRIC (832-6-12½)
PER 20 ROD ROLL IS 150 LB. ±10 LB. (NOTE: 12½ GAGE)
○ DENOTES STAPLE LOCATIONS

* OTHER WOVEN WIRE HEIGHTS AND NUMBER OF BARBED WIRE COMBINATIONS ARE AVAILABLE.

STAYS

1. USE WIRE STAYS ON ALL FENCES UNLESS WOOD STAYS ARE SPECIFIED.
2. LOCATE STAYS HALFWAY BETWEEN LINE POSTS.
3. WIRE STAYS FOR BARBED WIRE FENCING ARE 2" LONGER THAN THE DISTANCE BETWEEN THE TOP AND BOTTOM WIRES.
4. FOR WOVEN WIRE FENCING WITH BARBED WIRE ON TOP, EXTEND WIRE STAYS 6" MINIMUM BELOW THE TOP OF THE WOVEN WIRE.
5. WHEN WOOD STAYS ARE SPECIFIED, USE EITHER 2" ROUND, A ROUGH DIMENSION 2" × 2", OR A 1½" × 3½" (NOMINAL 2" × 4"). THE STAY MUST BE OF SUFFICIENT LENGTH TO BE PLACED ON THE GROUND WITH THE TOP OF THE STAY EXTENDING 2" ABOVE THE TOP WIRE. ATTACH EACH WIRE TO THE WOOD STAYS USING 1¾" × 9 GAGE STAPLES. WOOD STAYS DO NOT NEED TO BE TREATED.

NOTES:

"M" DENOTES METAL POSTS, EG. TYPE F3M.
"W" DENOTES WOOD POSTS, EG. TYPE F4W.

SEE DTL. DWG. NO. [illegible] AND DOUBLE PANEL DETAILS.
SEE DTL. DWG. NO. 607-10 FOR ADDITIONAL FENCING DETAILS.

SEE THE STANDARD SPECIFICATIONS FOR POST REQUIREMENTS.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 607
DWG. NO.
607-00

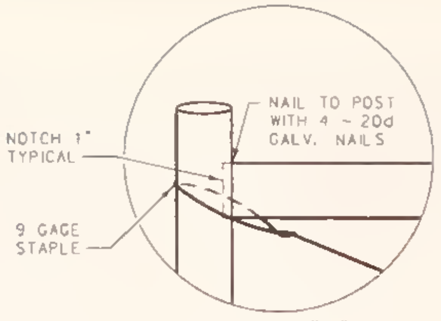
FARM FENCE

EFFECTIVE: AUGUST 1999

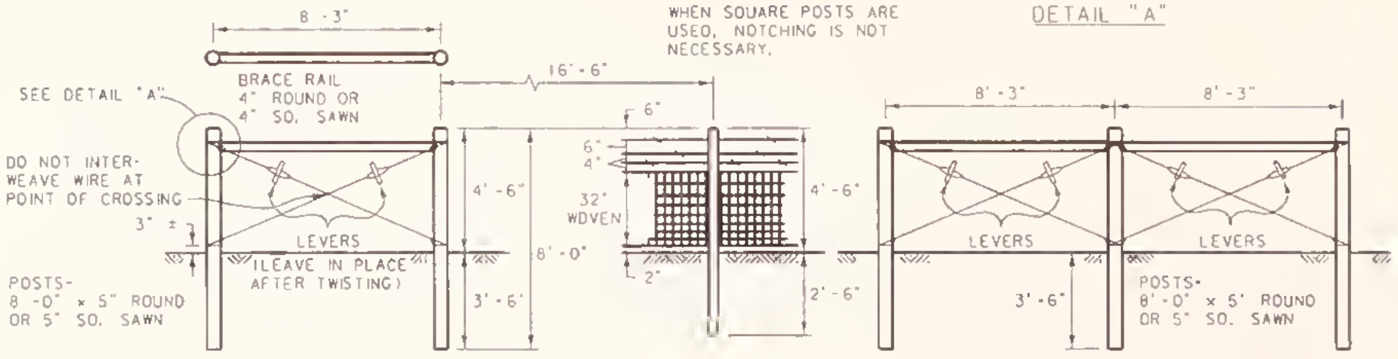
MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

BRACE WIRES - ONE CONTINUOUS 9 OR 12½ GAGE SMOOTH WIRE DOUBLED TO FORM A FOUR WIRE BRACE. TIE THE TWO ENDS NEAR THE TOP OF THE PANEL POSTS.

LEVERS - 1½" × 2" × 12" MINIMUM SIZE.



DETAIL "A"

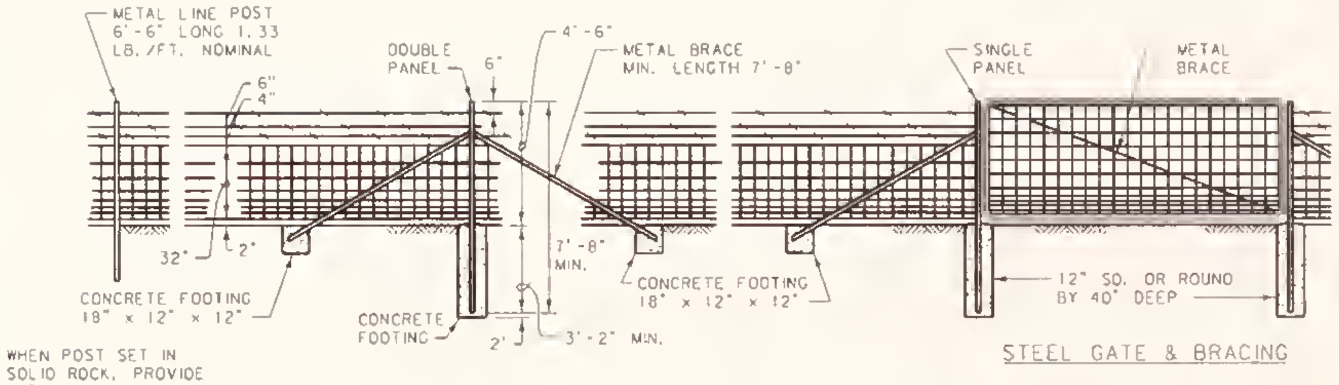

WHEN SQUARE POSTS ARE USED, NOTCHING IS NOT NECESSARY.
8'-3"
BRACE RAIL 4" ROUND OR 4" SQ. SAWN
SEE DETAIL "A"
16'-6"
6"
DO NOT INTER-WEAVE WIRE AT POINT OF CROSSING
3" ±
LEVERS
(LEAVE IN PLACE AFTER TWISTING)
POSTS- 8'-0" × 5" ROUND OR 5" SQ. SAWN
4'-6"
8'-0"
3'-6"
6"
4"
32" WOVEN
2"
4'-6"
2'-6"
8'-3"
8'-3"
LEVERS
LEVERS
3'-6"
POSTS- 8'-0" × 5" ROUND OR 5" SQ. SAWN

SINGLE PANEL
FOR PULLING, STRETCHING, CHANGES IN VERTICAL ALIGNMENT OR PANELS ON A RUN OF LESS THAN 330'.

LINE POST
7'-0" × 4" MIN. ROUND OR 4" × 4" SQ. SAWN

DOUBLE PANEL
FOR CORNERS, PULLING OR STRETCHING, AND CHANGES IN HORIZONTAL ALIGNMENT.

TYPE "CW" - "STRAIGHT RUN" FENCE WITH WOOD POSTS


METAL LINE POST 6'-6" LONG 1.33 LB./FT. NOMINAL
6"
4"
32"
2"
CONCRETE FOOTING 18" × 12" × 12"
WHEN POST SET IN SOLID ROCK, PROVIDE 18" MIN. BURIAL.
DOUBLE PANEL
6"
4'-6"
METAL BRACE MIN. LENGTH 7'-8"
7'-8" MIN.
CONCRETE FOOTING
2'
3'-2" MIN.
CONCRETE FOOTING 18" × 12" × 12"
SINGLE PANEL
METAL BRACE
12" SQ. OR ROUND BY 40" DEEP

STEEL GATE & BRACING

TYPE "CM" - FENCE WITH STEEL POSTS

NOTES:

SEE THE STANDARD SPECIFICATIONS FOR POST AND GATE REQUIREMENTS.

PLACE ALL FENCE WIRE ON PASTURE SIDE OF POST, EXCEPT ON CURVES. THEN, PLACE THE WIRE ON THE OUTSIDE OF THE CURVE.

IN AREAS SUBJECT TO HIGH VELOCITY WINDS AND MOVING DEBRIS, WIRES MAY BE PLACED ON WINDWARD SIDE OF POSTS, EXCEPT ON CURVES.

ALL CONCRETE IS CLASS "F" OR BETTER.

POST SPACING IS GENERALLY MEASURED PARALLEL TO GROUND.

LINE POST SPACING IS 16'-6" CENTER TO CENTER. LINE POST SPACING FROM BRACE OR PANEL POST IS 16'-6" CENTER TO CENTER.

PLACE 24" WIRE STAY HALFWAY BETWEEN POSTS. DO NOT PLACE STAYS ON PANELS FOR "CM" AND "CW" FENCE.

TYPE "CW" FENCE HAS ONE METAL POST IN PLACE OF A WOODEN LINE POST IN EACH 500' RUN FOR LIGHTNING PROTECTION.

USE TYPE "CW" (WOOD) PANELS ON ALL TYPE "CM" (METAL) FENCES INSTEAD OF STEEL PANELS UNLESS OTHERWISE SPECIFIED.

SET STEEL CORNER, END, GATE AND PULL POSTS, AND EACH BRACE IN CONCRETE AS SHOWN.

SEE DTL. DWG. NO. 607-10 FOR ADDITIONAL FENCING DETAILS.

A DEADMAN MAY BE A PRECAST CONCRETE BLOCK, A CAST IN PLACE CONCRETE BLOCK, A ROCK OR OTHER APPROVED OBJECT WEIGHING AT LEAST 150 LB. BURY THE DEADMAN IN THE GROUND WITH AT LEAST 2'-0" OF COVER. ATTACH THE DEADMAN TO THE FENCE WITH 3 STRANDS OF 9 GAGE WIRE OR 6 STRANDS OF 12½ GAGE WIRE. SEE DETAILED DRAWING NO. 607-10 FOR ALTERNATE DEADMAN.

STAPLE THE BOTTOM, TOP, CENTER AND ALTERNATE WIRES OF WOVEN WIRE TO WOOD LINE POSTS.

TIE THE BOTTOM, TOP, CENTER AND ALTERNATE WIRES OF WOVEN WIRE TO STEEL LINE POSTS.

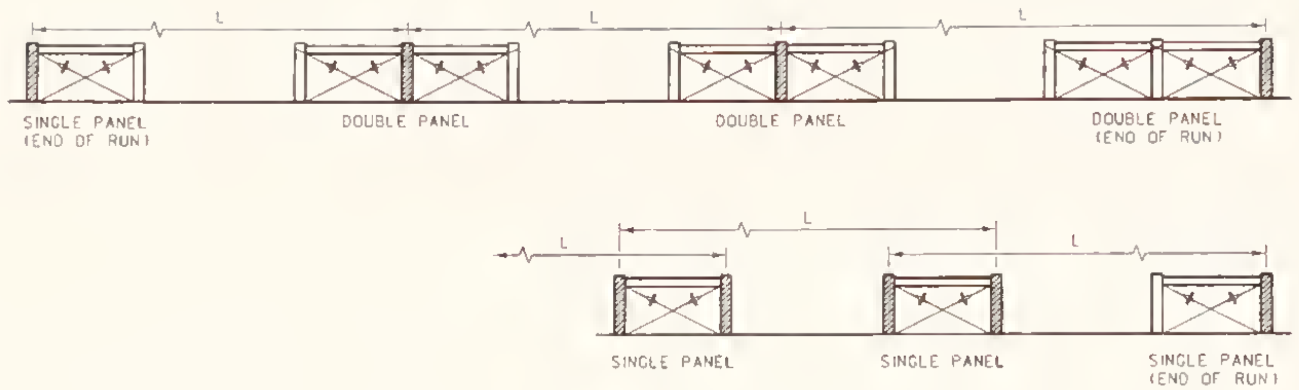
STAPLE ALL WIRES OF WOVEN WIRE TO WOOD CORNER POSTS OR POST USED TO TIE-OFF WIRE.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 607
DWG. NO.
607-05

INTERSTATE FENCE

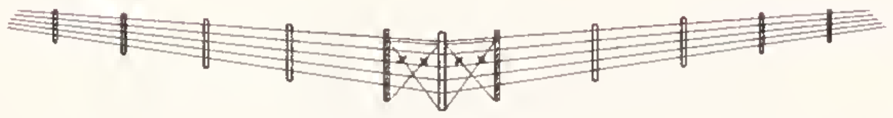
EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

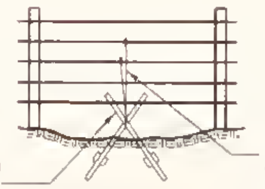


FENCE TYPE	RUN = L	PANELS REQUIRED
COMBINATION WOVEN/BARBED	LESS THAN 33'	NONE
	33' - 330'	SINGLE
	OVER 330' TO 660' MAX.	DOUBLE
BARBED	LESS THAN 66'	NONE
	66'-660'	SINGLE
	OVER 660' TO 990' MAX.	DOUBLE

NOTE:
TIE OFF ON ALL CROSS HATCHED OR SHADED POSTS.


DOUBLE PANEL AT FENCE CORNER OR ANGLE BREAK

FENCE PANEL TYPES


METAL LINE POSTS DRIVEN INTO GROUND AT LEAST THREE FEET
THREE STRANDS OF 9 GAGE WIRE TIED AROUND AT LEAST TWO LINE WIRES AND AROUND THE JUNCTION OF THE METAL POSTS

ALTERNATE DEADMAN

WHEN APPROVED BY THE ENGINEER THE ABOVE DEADMAN MAY BE USED IN LIEU OF A ROCK OR PRECAST CONCRETE BLOCK AS SPECIFIED ON DTL. DWG. NO. 607-05.

NOTES:

ATTACH BARBED WIRES TO POSTS BY WRAPPING AROUND THE POST AT LEAST TWO TIMES. THEN WRAPPING AROUND ITSELF FIVE TIMES.

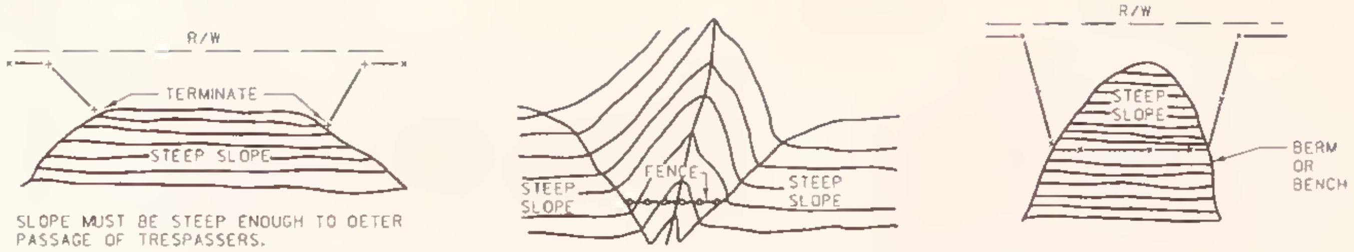
TO ATTACH WOVEN WIRE TO AN END POST, REMOVE TWO OR THREE VERTICAL STAY WIRES FROM THE END OF THE FENCE. PLACE THE FIRST COMPLETE VERTICAL STAY WIRE AGAINST THE POST. START AT THE MIDDLE OF THE HORIZONTAL LINE WIRES, WRAPPING AROUND THE END POST AT LEAST TWO TIMES AND THEN WRAPPING AROUND ITSELF FIVE TIMES.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 607
DWG. NO.
607-10

FENCING DETAILS

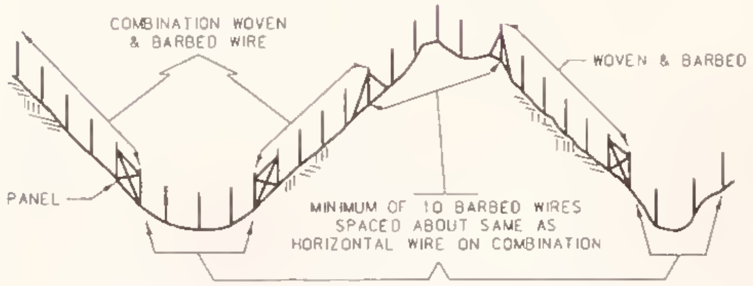
EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



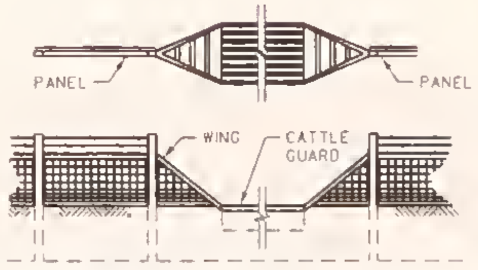
SLOPE MUST BE STEEP ENOUGH TO DETER PASSAGE OF TRESPASSERS.

FENCE LAYOUT ON STEEP SLOPES


COMBINATION WOVEN & BARBED WIRE
WOVEN & BARBED
PANEL
MINIMUM OF 10 BARBED WIRES SPACED ABOUT SAME AS HORIZONTAL WIRE ON COMBINATION

FENCE LAYOUT ON SHARP VERTICAL CURVES

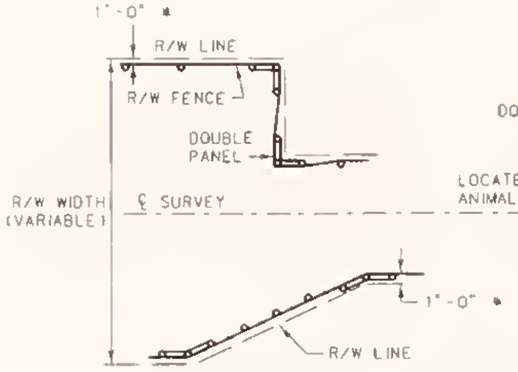
TO AVOID TRYING TO CONFORM WOVEN WIRE TO UNEVEN TERRAIN



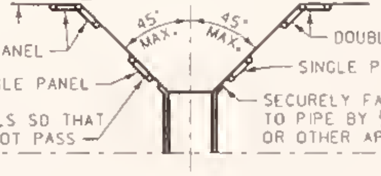
FENCE CONNECTION TO CATTLE GUARD

SECURELY FASTEN FENCE WIRE TO THE WINGS AND ARRANGE SO THAT ANIMALS CANNOT PASS.

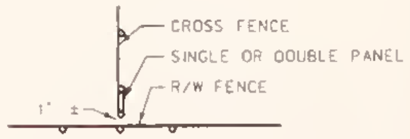
* ONE FOOT OFFSET APPLIES TO INTERSTATE FENCING ONLY.



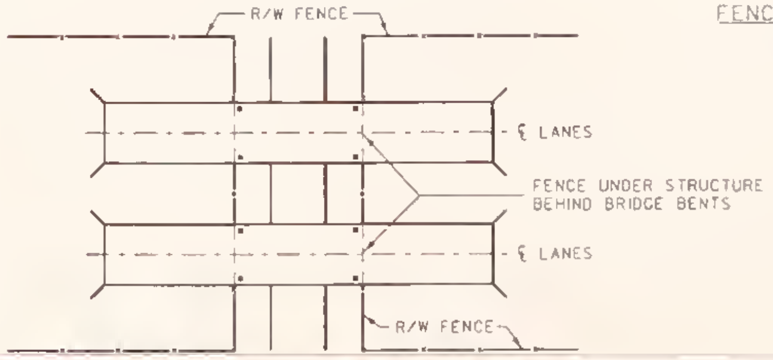
FENCE LAYOUT AT CHANGE IN R/W WIDTH


1'-0" *
R/W LINE
45° MAX.
45° MAX.
DOUBLE PANEL
DOUBLE PANEL
SINGLE PANEL
SINGLE PANEL
LOCATE PANELS SO THAT ANIMALS CANNOT PASS
SECURELY FASTEN WING FENCE TO PIPE BY ½" DIA. EYE BOLTS OR OTHER APPROVED METHOD.

FENCE LAYOUT AT STOCKPASS, BRIDGES AND LARGE PIPES



FENCE LAYOUT AT CROSS-FENCE CONNECTION



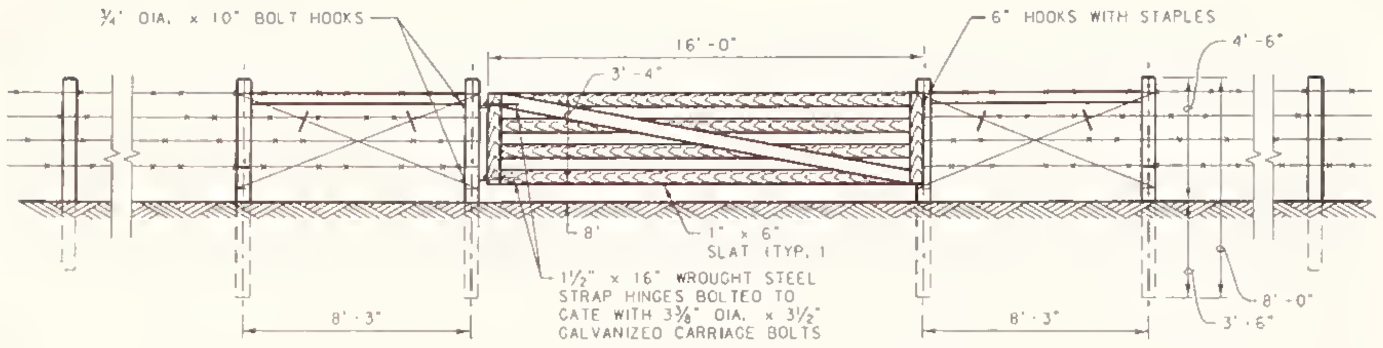
FENCE LAYOUT AT LOCAL ROAD UNDER INTERSTATE

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 607
DWG. NO.
607-15

FENCING DETAILS

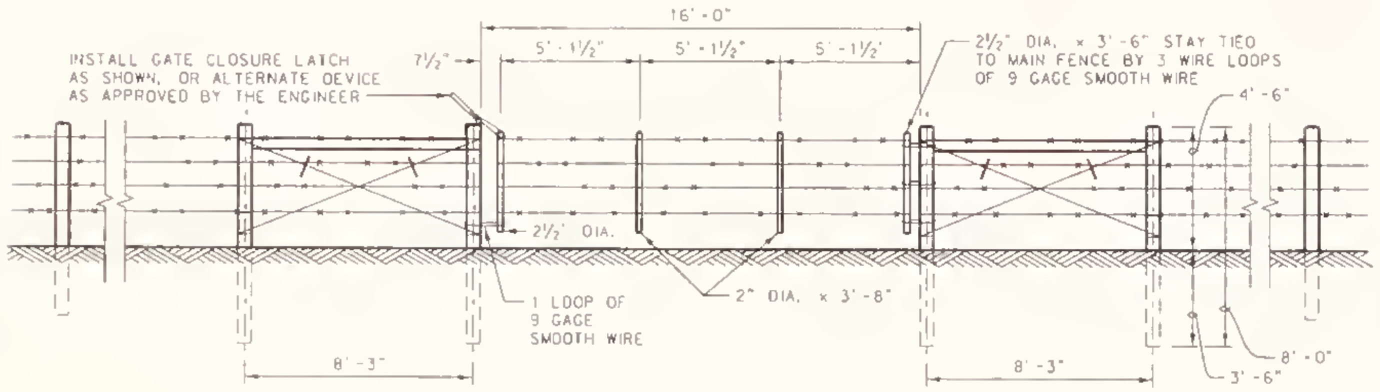
EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD


3/4" DIA. × 10" BOLT HOOKS
6" HOOKS WITH STAPLES
16'-0"
3'-4"
4'-6"
8"
1" × 6" SLAT (TYP.)
1 1/2" × 16" WROUGHT STEEL STRAP HINGES BOLTED TO GATE WITH 3 3/8" DIA. × 3 1/2" GALVANIZED CARRIAGE BOLTS
8'-3"
8'-3"
8'-0"
3'-6"

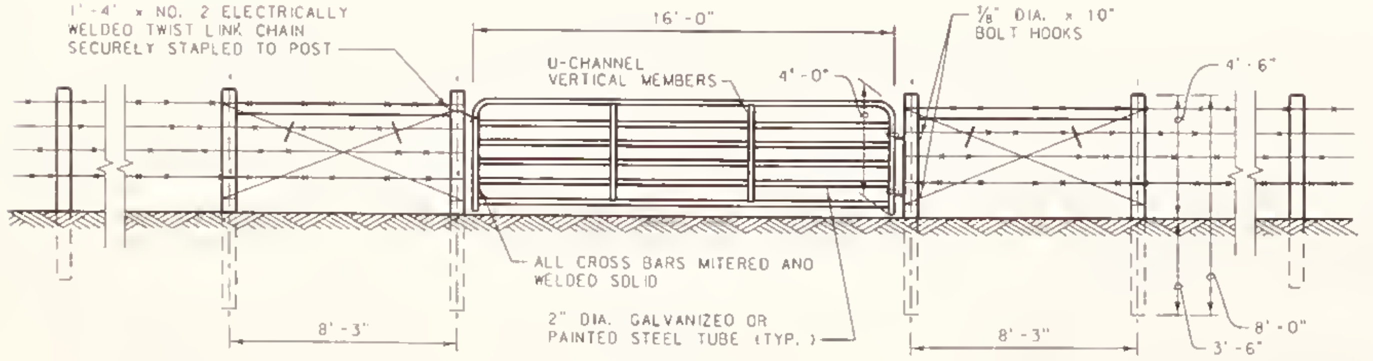
WOOD FARM ENTRANCE GATE (TYPE G-1)

NOTE: USE 10d NAILS AND CLINCH FOR GATE CONSTRUCTION.


INSTALL GATE CLOSURE LATCH AS SHOWN, OR ALTERNATE DEVICE AS APPROVED BY THE ENGINEER
7 1/2"
16'-0"
5'-1 1/2"
5'-1 1/2"
5'-1 1/2"
2 1/2" DIA. × 3'-6" STAY TIED TO MAIN FENCE BY 3 WIRE LOOPS OF 9 GAGE SMOOTH WIRE
4'-6"
2 1/2" DIA.
1 LOOP OF 9 GAGE SMOOTH WIRE
2" DIA. × 3'-8"
8'-3"
8'-3"
8'-0"
3'-6"

WIRE FARM ENTRANCE GATE (TYPE G-2)

NOTE:
USE SAME WIRE SCHEME ON GATE AS THAT USED ON FENCE, UNLESS STATED OTHERWISE IN R/W AGREEMENT.


1'-4" × NO. 2 ELECTRICALLY WELDED TWIST LINK CHAIN SECURELY STAPLED TO POST
16'-0"
U-CHANNEL VERTICAL MEMBERS
4'-0"
3/8" DIA. × 10" BOLT HOOKS
4'-6"
ALL CROSS BARS MITERED AND WELDED SOLID
2" DIA. GALVANIZED OR PAINTED STEEL TUBE (TYP.)
8'-3"
8'-3"
8'-0"
3'-6"

METAL FARM ENTRANCE GATE (TYPE G-3)

NOTES:

ALL GATES ARE 16'-0" WIDE UNLESS R/W AGREEMENT STATES OTHERWISE.

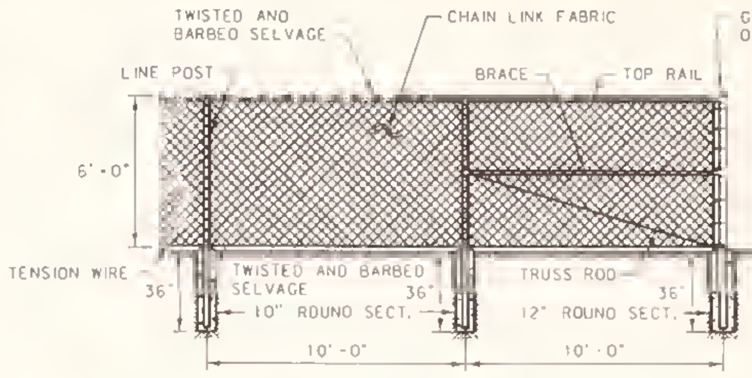
ALL GATES WILL HAVE A SINGLE OR DOUBLE PANEL AT EACH END.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 607
DWG. NO.
607-20

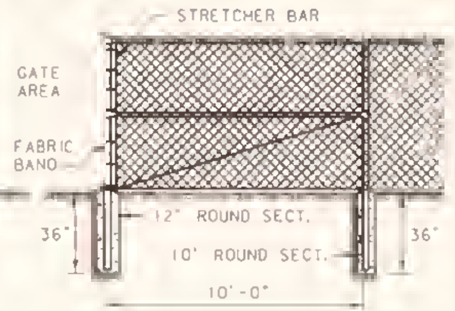
FARM ENTRANCE
GATES

EFFECTIVE: AUGUST 1999

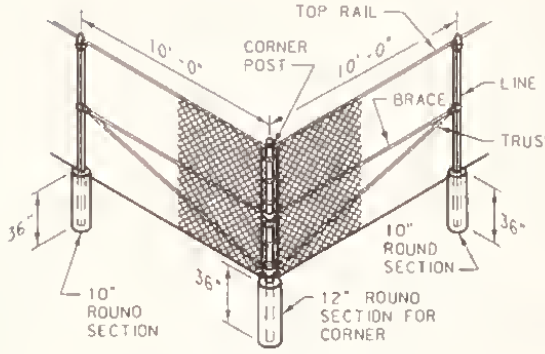
MONTANA DEPARTMENT
OF TRANSPORTATION
MONTANA
CADD



6' CHAIN LINK FENCE

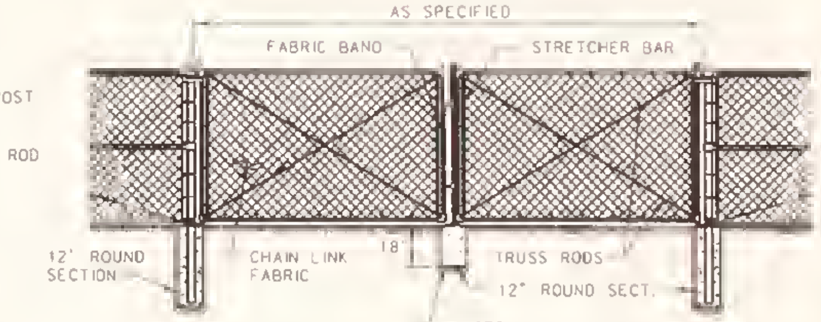


SINGLE PANEL



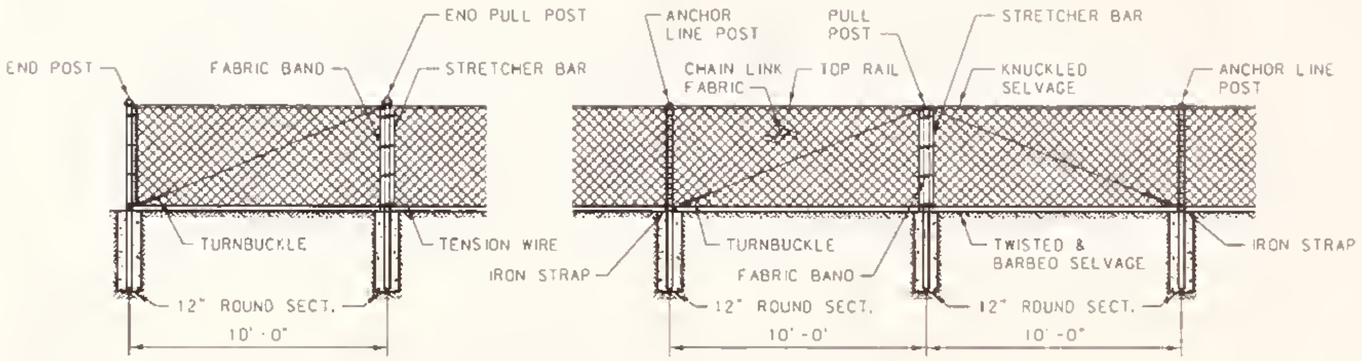
DOUBLE PANEL

PULL POST AND CORNER POST BRACING



NOTE:
NO CONCRETE BLOCK REQUIRED FOR SINGLE GATE. GATE LATCHES DIRECTLY TO POST.

GATES



CHAIN LINK FENCE - 3', 4' AND 5'

NOTES:

SEE THE STANDARD SPECIFICATIONS FOR FURTHER REQUIREMENTS.

DO NOT INSTALL DOUBLE PANELS MORE THAN 300' APART ON TANGENTS OR MORE THAN 250' APART ON ANY CURVE. FOR CURVES SHARPER THAN 5', INSTALL A DOUBLE PANEL ON EACH CURVE END, PLUS ONE ADDITIONAL PANEL FOR EACH 10' OF DEFLECTION, EVENLY SPACED, BETWEEN THE CURVE ENDS.

PULL POST BRACING ON 6 FOOT FENCE IS THE SAME AS CORNER BRACING.

A DROP BAR LOCKING DEVICE IS REQUIRED FOR ALL DOUBLE GATE INSTALLATIONS. THE DROP BAR MUST BE ABLE TO BE INSERTED INTO THE CONCRETE BLOCK AT LEAST SIX INCHES.

ALL CONCRETE IS CLASS "F" OR BETTER.

WHEN FENCE IS LESS THAN 50' FROM THE EDGE OF A DRIVING LANE, USE A 3/8" DIA. GALVANIZED STEEL CABLE IN PLACE OF THE TOP METAL BRACE RAIL.

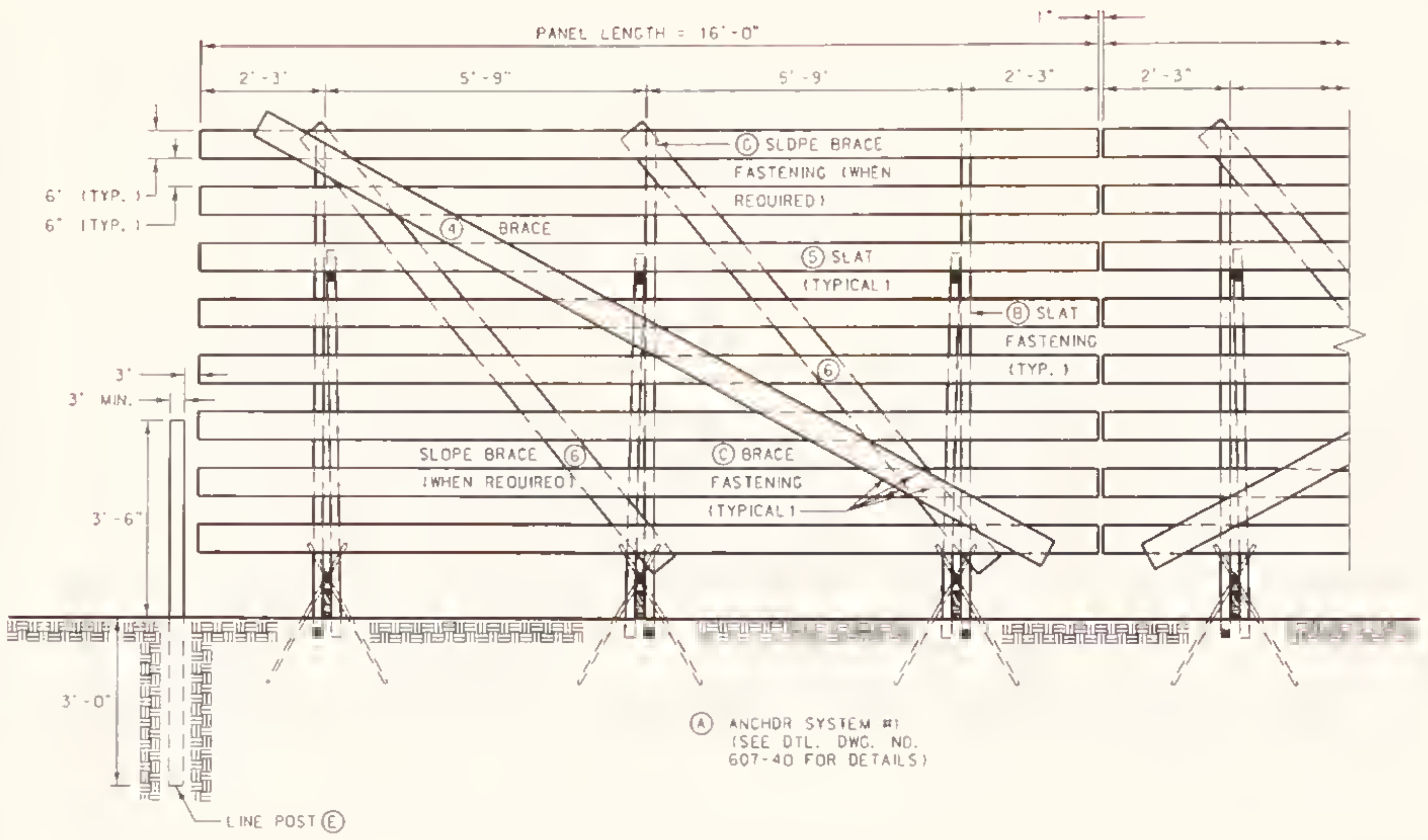
HEIGHT OF FABRIC	WIRE FABRIC ABOVE GROUND	DEPTH OF CONCRETE	DEPTH OF POST IN CONC. (MIN.)
6'	1" TO 2"	36"	32'
5'	1" TO 2"	36"	32'
4'	1" TO 2"	30"	26'
3'	1" TO 2"	30"	26'

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 607
DWG. NO.
607-25

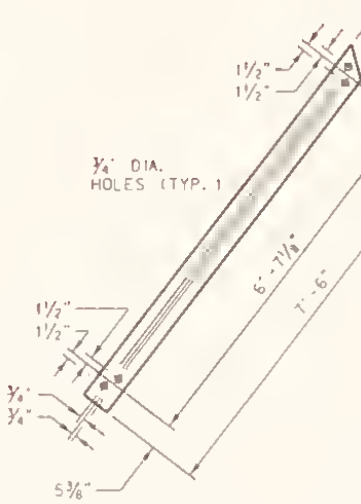
CHAIN LINK FENCE

EFFECTIVE: AUGUST 1999

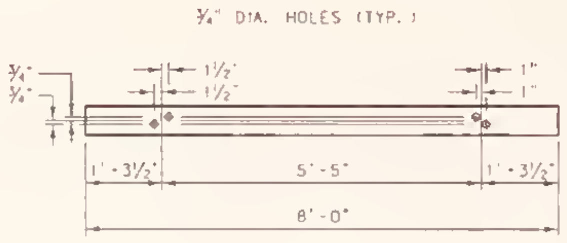
MONTANA DEPARTMENT
OF TRANSPORTATION
MONTANA
CADD


PANEL LENGTH = 16'-0"
1"
2'-3"
5'-9"
5'-9"
2'-3"
2'-3"
6" (TYP.)
6" (TYP.)
Ⓖ SLOPE BRACE FASTENING (WHEN REQUIRED)
④ BRACE
⑤ SLAT (TYPICAL)
Ⓑ SLAT FASTENING (TYP.)
⑥
3"
3" MIN.
SLOPE BRACE ⑥ (WHEN REQUIRED)
Ⓒ BRACE FASTENING (TYPICAL)
3'-6"
3'-0"
Ⓐ ANCHOR SYSTEM #1 (SEE DTL. DWG. NO. 607-40 FOR DETAILS)
LINE POST Ⓔ

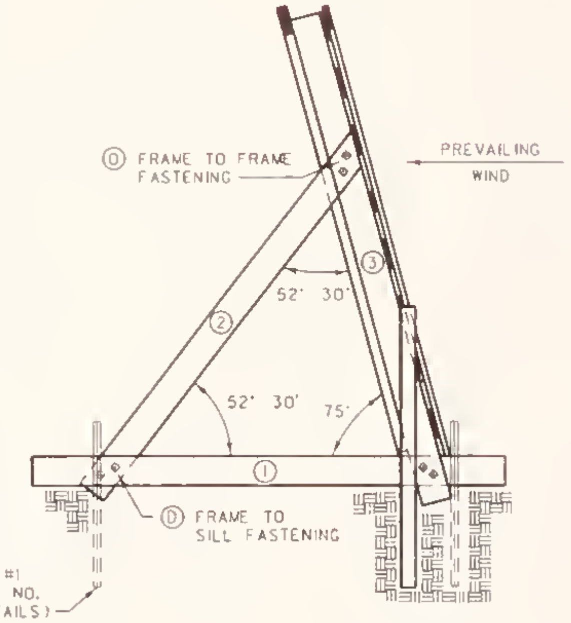
FRONT VIEW



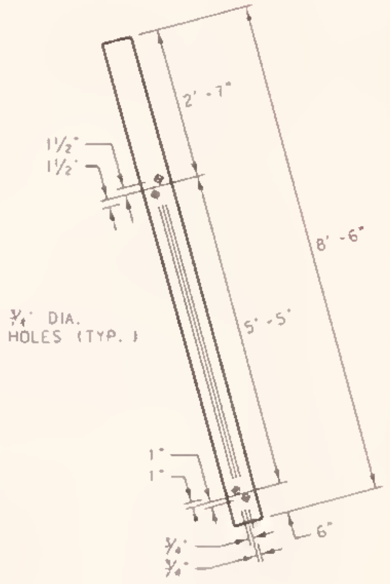
② FRAME



① SILL


Ⓓ FRAME TO FRAME FASTENING
PREVAILING WIND
③
52° 30'
②
52° 30'
75°
①
Ⓓ FRAME TO SILL FASTENING
Ⓐ ANCHOR SYSTEM #1 (SEE DTL. DWG. NO. 607-40 FOR DETAILS)

END VIEW



③ FRAME

GENERAL NOTES

Ⓐ ANCHOR SYSTEM DETAIL
USE ANCHOR SYSTEM #1 UNLESS SOIL AND MOISTURE CONDITIONS NECESSITATE THE USE OF AN ALTERNATE SYSTEM, OR AS DIRECTED BY THE ENGINEER. CONSULT DETAILED DRAWING NUMBERS 607-40 AND 607-45 FOR ANCHOR SYSTEMS #3 (ROCKY CONDITIONS) AND #2 (SWAMPY CONDITIONS).

Ⓑ SLAT FASTENING
FASTEN SLATS TO THE FRAME WITH 3 ~ 12d COMMON BARBED SHANK NAILS AT EACH LOCATION.

Ⓒ BRACE FASTENING
FASTEN BRACES TO THE FRAME WITH 4 ~ 8d COMMON NAILS AT EACH LOCATION AND CLINCH.

Ⓓ FRAME TO SILL AND FRAME TO FRAME FASTENING
FASTEN THE SILL AND FRAME MEMBERS TO THE FRAME AT EACH LOCATION WITH 2 ~ ⅝" DIA. x 5" STANDARD MACHINE BOLTS, EACH WITH HEX NUT AND TWO FLAT WASHERS. SEE NOTE ⓧ AT RIGHT.

Ⓔ LINE POSTS
PLACE LINE POSTS AT EACH END OF EACH LINE OF SNOW FENCE AS SHOWN. POSTS ARE 6'-6" LONG WITH A MINIMUM DIAMETER OF 3" AND A MAXIMUM DIAMETER OF 6". BUTT TREAT 3' MINIMUM.

Ⓕ WIRE TIE
USE 12 GAGE OR HEAVIER GALVANIZED WIRE TO FORM THE WIRE TIES.

Ⓖ SLOPE BRACE FASTENING
FASTEN SLOPE BRACES WITH 3 ~ 16d COMMON BARBED SHANK NAILS AT EACH LOCATION.

LUMBER - 8' SNOW FENCE W/ ANCHOR SYSTEM #1

BILL OF MATERIALS FOR ONE PANEL

ITEM NO.	NO. OF PIECES	LUMBER SIZE	DESCRIPTION
①*	3	2" x 6" x 8'-0"	FRAME (SILL)
②*	3	2" x 6" x 7'-6"	FRAME
③*	3	2" x 6" x 8'-6"	FRAME
* NOTE: PRESSURE TREAT ALL 2" x 6" MEMBERS (ENTIRE FRAME)			
④	1	1" x 6" x 16'-0"	BRACE
⑤	8	1" x 6" x 16'-0"	SLAT
⑥**	2	2" x 6" x 10'-0"	SLOPE BRACE

** NOTE: USE ONLY WHEN SLOPE IS 5:1 OR GREATER

HARDWARE - 8' SNOW FENCE W/ ANCHOR SYSTEM #1

BILL OF MATERIALS FOR ONE PANEL

	QUANTITY	DESCRIPTION
Ⓓ	18	⅝" DIA. x 5" HEX BOLT (THREADED FULL LENGTH) AND NUT
Ⓓ	36	FLAT WASHER FOR ⅝" DIA. BOLT
Ⓑ	1 LB.	12d COMMON BARBED SHANK NAIL
Ⓐ	12	#6 REBAR x 5'-0" (¾" DIA.)
Ⓕ	6 PIECES	12 GAGE TIE WIRE x 5'-0" ±
Ⓒ	⅓ LB.	8d COMMON NAILS
Ⓖ	¼ LB.	16d COMMON BARBED SHANK NAILS

ALL NAILS MAY BE EITHER HAND DRIVEN OR DRIVEN WITH A PNEUMATIC NAILER.

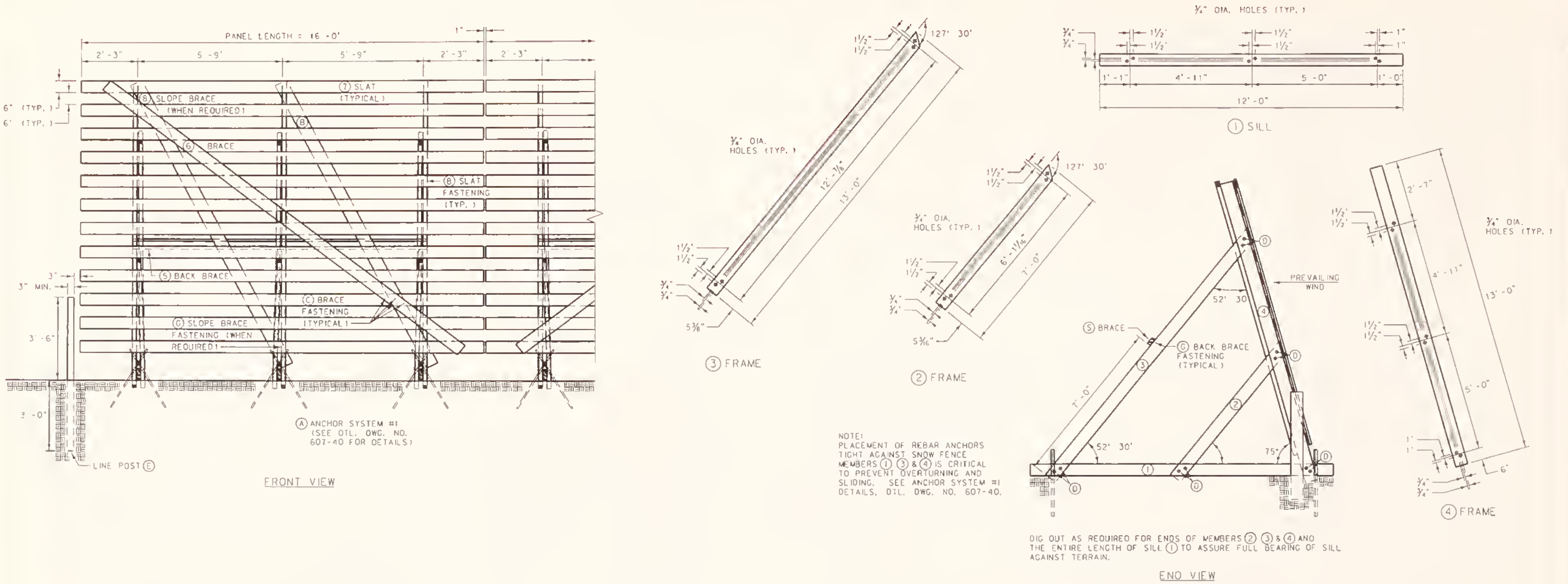
ⓧ NOTE:
AFTER ⅝" DIA. BOLTS HAVE BEEN TIGHTENED, BURR THE THREAD DIRECTLY BEHIND THE NUT TO PREVENT EVENTUAL LOOSENING OF THE NUTS.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 607
DWG. NO.
607-30

8' WOOD SNOW FENCE
W/ ANCHOR SYSTEM #1

EFFECTIVE: AUGUST 1999

MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



NOTE:
PLACEMENT OF REBAR ANCHORS TIGHT AGAINST SNOW FENCE MEMBERS ① ③ & ④ IS CRITICAL TO PREVENT OVERTURNING AND SLIDING. SEE ANCHOR SYSTEM #1 DETAILS, DTL. DWG. NO. 607-40.

DIG OUT AS REQUIRED FOR ENDS OF MEMBERS ② ③ & ④ AND THE ENTIRE LENGTH OF SILL ① TO ASSURE FULL BEARING OF SILL AGAINST TERRAIN.

END VIEW

GENERAL NOTES

Ⓐ ANCHOR SYSTEM DETAIL
USE ANCHOR SYSTEM #1 UNLESS SOIL AND MOISTURE CONDITIONS NECESSITATE THE USE OF AN ALTERNATE SYSTEM, OR AS DIRECTED BY THE ENGINEER. CONSULT DETAILED DRAWING NUMBERS 607-40 AND 607-45 FOR ANCHOR SYSTEMS #3 (ROCKY CONDITIONS) AND #2 (SWAMPY CONDITIONS).

Ⓑ SLAT FASTENING
FASTEN SLATS TO THE FRAME WITH 3 ~ 12d COMMON BARBED SHANK NAILS AT EACH LOCATION.

Ⓒ BRACE FASTENING
FASTEN BRACES TO THE FRAME WITH 4 ~ 8d COMMON NAILS AT EACH LOCATION AND CLINCH.

Ⓓ FRAME TO SILL AND FRAME TO FRAME FASTENING
FASTEN THE SILL AND FRAME MEMBERS TO THE FRAME AT EACH LOCATION WITH 2 ~ ⅝" DIA. × 5" STANDARD MACHINE BOLTS, EACH WITH HEX NUT AND TWO FLAT WASHERS. SEE NOTE Ⓧ AT RIGHT.

Ⓔ LINE POSTS
PLACE LINE POSTS AT EACH END OF EACH LINE OF SNOW FENCE AS SHOWN. POSTS ARE 6'-6" LONG WITH A MINIMUM DIAMETER OF 3" AND A MAXIMUM DIAMETER OF 6". BUTT TREAT 3' MINIMUM.

Ⓕ WIRE TIE
USE 12 GAGE OR HEAVIER GALVANIZED WIRE TO FORM THE WIRE TIES.

Ⓖ BACK & SLOPE BRACE FASTENING
FASTEN BACK BRACES TO THE FRAME WITH 2 ~ 16d NAILS, AND FASTEN THE SLOPE BRACES WITH 3 ~ 16d BARBED SHANK NAILS AT EACH LOCATION.

LUMBER - 12' SNOW FENCE W/ ANCHOR SYSTEM #1			
BILL OF MATERIALS FOR ONE PANEL			
ITEM NO.	NO. OF PIECES	LUMBER SIZE	DESCRIPTION
① *	3	2" × 6" × 12'-0"	SILL
② *	3	2" × 6" × 7'-0"	FRAME
③ *	3	2" × 6" × 13'-0"	FRAME
④ *	3	2" × 6" × 13'-0"	FRAME
* NOTE: PRESSURE TREAT ALL 2" × 6" MEMBERS (ENTIRE FRAME)			
⑤	1	2" × 4" × 12'-0"	BACK BRACE
⑥	1	1" × 6" × 18'-0"	BRACE
⑦	12	1" × 6" × 16'-0"	SLAT
⑧ **	2	2" × 6" × 13'-0"	SLOPE BRACE
** NOTE: USE ONLY WHEN SLOPE IS 5:1 OR GREATER			

	HARDWARE - 12' SNOW FENCE W/ ANCHOR SYSTEM #1	
	BILL OF MATERIALS FOR ONE PANEL	
	QUANTITY	DESCRIPTION
Ⓓ	30	⅝" DIA. × 5" HEX BOLT (THREADED FULL LENGTH) AND NUT
Ⓓ	60	FLAT WASHER FOR ⅝" DIA. BOLT
Ⓒ	½ LB.	8d COMMON NAILS
Ⓑ	1⅔ LB.	12d COMMON BARBED SHANK NAILS
Ⓖ	½ LB.	16d COMMON BARBED SHANK NAILS
Ⓐ	12	#6 REBAR × 5'-0" (¾" DIA.)
Ⓕ	6 PIECES	12 GAGE TIE WIRE × 5'-0" ±

ALL NAILS MAY BE EITHER HAND DRIVEN OR DRIVEN WITH A PNEUMATIC NAILER.

Ⓧ NOTE:
AFTER ⅝" DIA. BOLTS HAVE BEEN TIGHTENED, BURR THE THREAD DIRECTLY BEHIND THE NUT TO PREVENT EVENTUAL LOOSENING OF THE NUTS.

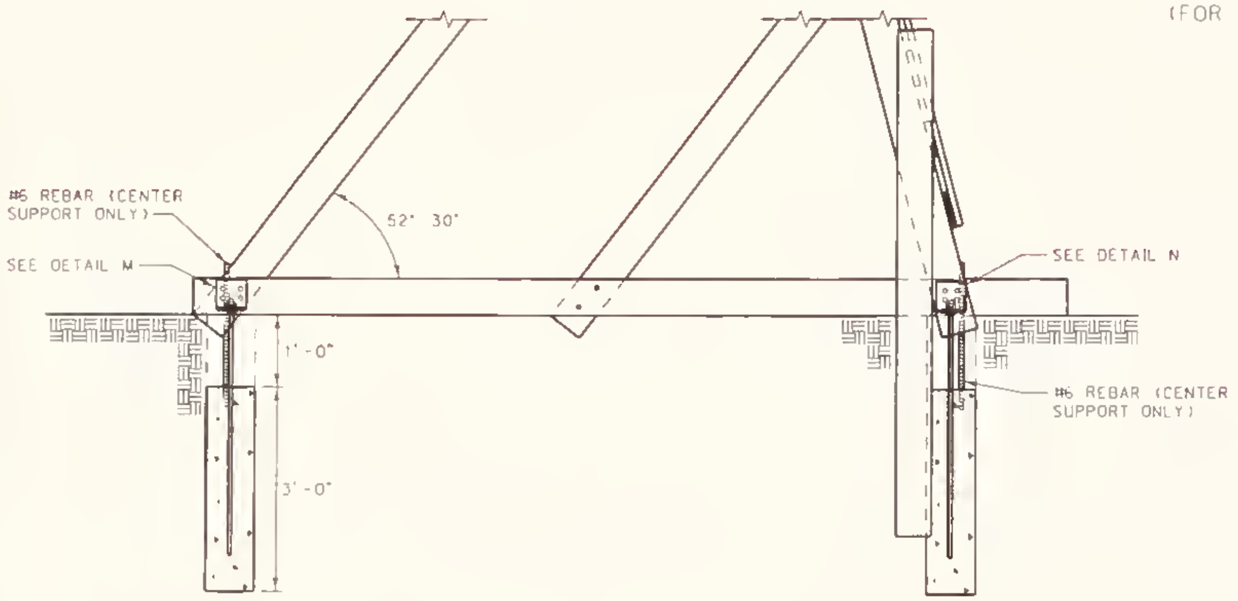
DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 607
DWG. NO.
607-35

12' WOOD SNOW FENCE
W/ ANCHOR SYSTEM #1

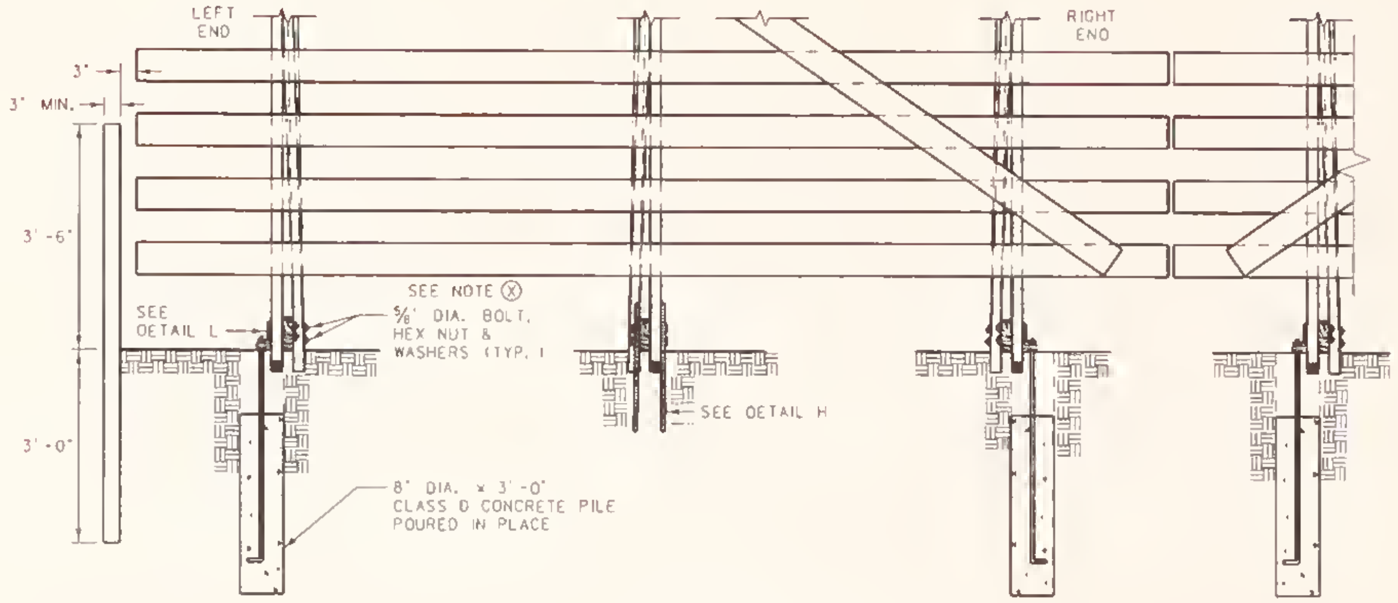
EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

ANCHOR SYSTEM #3
(FOR ROCKY CONDITIONS)

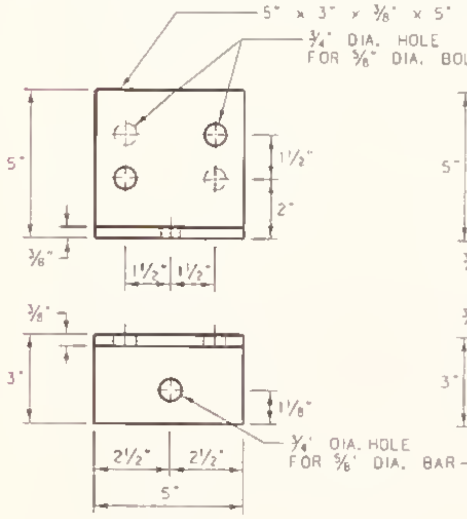

#6 REBAR (CENTER SUPPORT ONLY)
SEE DETAIL M
52° 30'
1'-0"
3'-0"
SEE DETAIL N
#6 REBAR (CENTER SUPPORT ONLY)

LEFT END VIEW

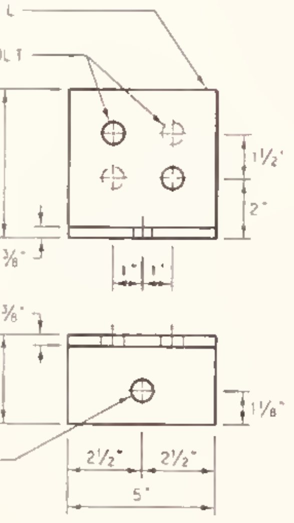

LEFT END
RIGHT END
3"
3" MIN.
3'-6"
3'-0"
SEE NOTE ⓧ
SEE DETAIL L
5/8" DIA. BOLT, HEX NUT & WASHERS (TYP.)
SEE DETAIL H
8" DIA. × 3'-0" CLASS D CONCRETE PILE POURED IN PLACE

FRONT VIEW

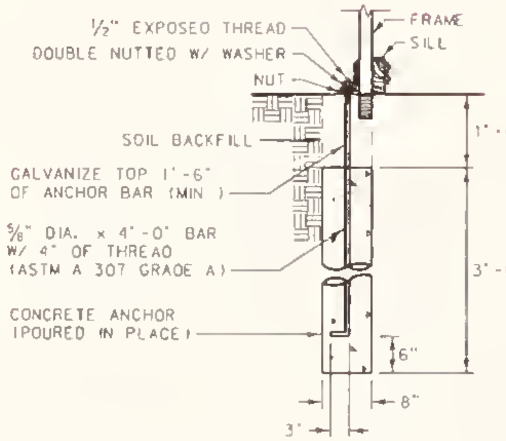
NOTE:
HOLES SHOWN IN DETAILS BELOW ARE FOR LEFT END OF FENCE.
HOLES SHOWN HIDDEN ARE FOR RIGHT END OF FENCE.



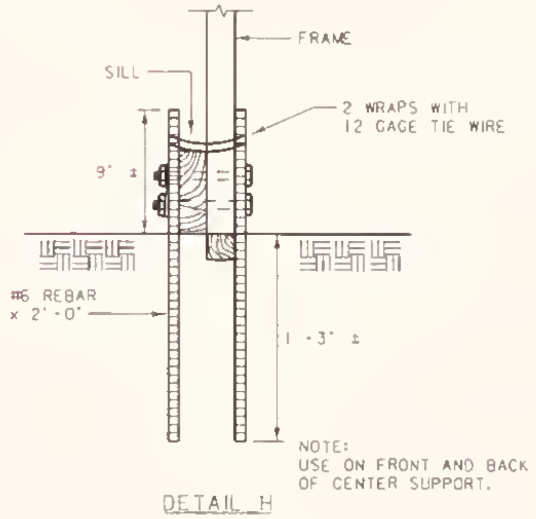
DETAIL M



DETAIL N


1/2" EXPOSED THREAD
DOUBLE NUTTED W/ WASHER
NUT
FRAME
SILL
SOIL BACKFILL
GALVANIZE TOP 1'-6" OF ANCHOR BAR (MIN.)
5/8" DIA. × 4'-0" BAR W/ 4" OF THREAD (ASTM A 307 GRADE A)
CONCRETE ANCHOR (POURED IN PLACE)
1'-0"
3'-0"
6"
8"
3"

DETAIL L



NOTE:
USE ON FRONT AND BACK OF CENTER SUPPORT.

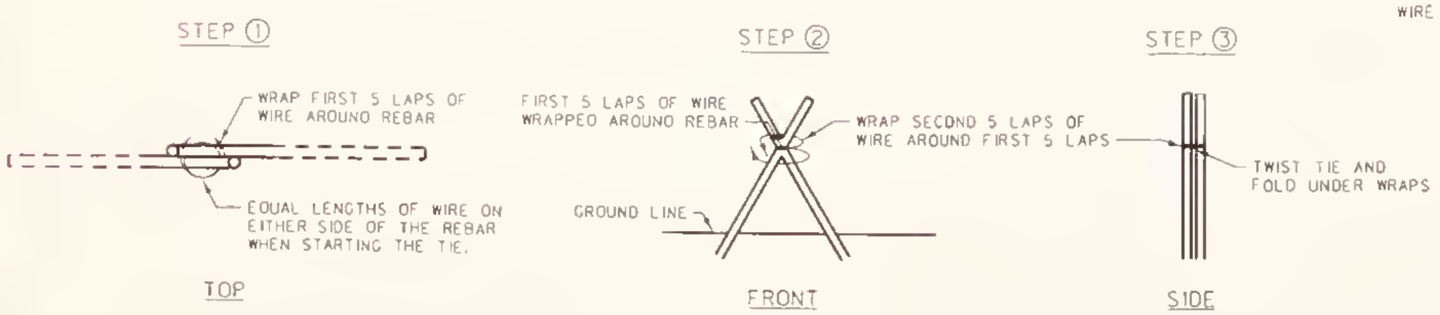
DETAIL H

LUMBER - SNOW FENCE W/ ANCHOR SYSTEM #3
BILL OF MATERIALS FOR ONE PANEL
SAME AS FOR SNOW FENCE W/ ANCHOR SYSTEM #1

HARDWARE - SNOW FENCE W/ ANCHOR SYSTEM #3	
BILL OF MATERIALS FOR ONE PANEL	
QUANTITY	DESCRIPTION
4	5" × 3" × 3/8" × 5" L
4	5/8" DIA. × 4'-0" BAR W/ 3 HEX NUTS
4	FLAT WASHERS FOR 5/8" DIA. BAR
0.16 C.Y.	CLASS D CONCRETE
4	#6 REBAR × 2'-0" (3/4" DIA.)
4 PIECES	12 GAGE TIE WIRE × 2'-0" ±
30	5/8" DIA. × 5" HEX BOLT (THREADED FULL LENGTH) AND NUT ← SEE NOTE ⓧ BELOW
60	FLAT WASHERS FOR 5/8" DIA. BOLT
NOTE: NAILS REQUIRED ARE SAME AS SHOWN ON HARDWARE SUMMARY FOR SNOW FENCE W/ ANCHOR SYSTEM #1	

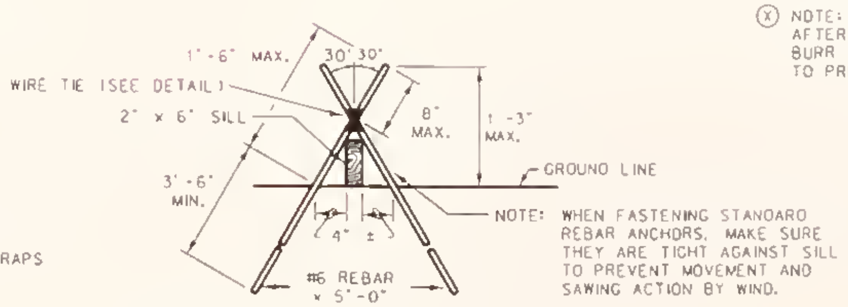
ⓧ NOTE:
AFTER 5/8" DIA. BOLTS HAVE BEEN TIGHTENED, BURR THE THREAD DIRECTLY BEHIND THE NUT TO PREVENT EVENTUAL LOOSENING OF THE NUTS.

ANCHOR SYSTEM #1
(STANDARD)


STEP ①
WRAP FIRST 5 LAPS OF WIRE AROUND REBAR
EQUAL LENGTHS OF WIRE ON EITHER SIDE OF THE REBAR WHEN STARTING THE TIE.
TOP
STEP ②
FIRST 5 LAPS OF WIRE WRAPPED AROUND REBAR
WRAP SECOND 5 LAPS OF WIRE AROUND FIRST 5 LAPS
GROUND LINE
FRONT
STEP ③
TWIST TIE AND FOLD UNDER WRAPS
SIDE

WIRE TIE DETAIL

USE 12 GAGE OR HEAVIER GALVANIZED WIRE TO FORM THE WIRE TIES.



NOTE: WHEN FASTENING STANDARD REBAR ANCHORS, MAKE SURE THEY ARE TIGHT AGAINST SILL TO PREVENT MOVEMENT AND SAWING ACTION BY WIND.

USE TWO #6 REINFORCING BARS FOR EACH END OF EACH SILL MEMBER. DRIVE THE BARS UP TIGHT TO THE FRAME TO PREVENT SLIDING. TIE THE REINFORCING BARS AS SHOWN IN THE WIRE TIE DETAIL. THE PLACEMENT OF THE ANCHORS IS CRITICAL IN PREVENTING OVERTURNING AND SLIDING OF THE FENCE.

STANDARD ANCHOR DETAIL

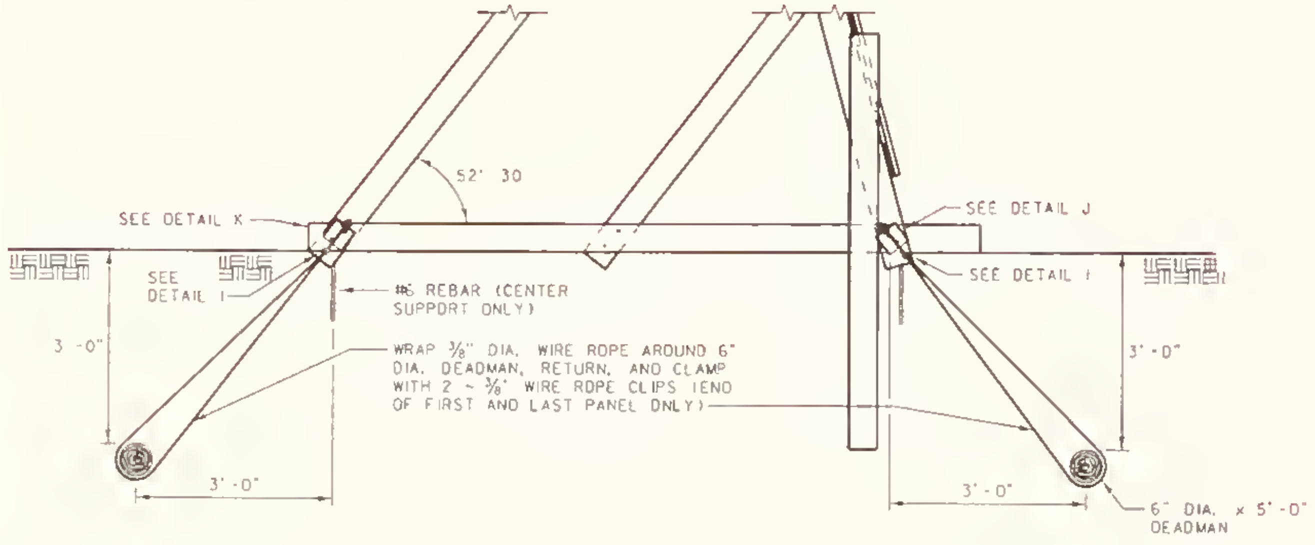
DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 607
DWG. NO.
607-40

WOOD SNOW FENCE
ANCHOR SYSTEM #3
AND #1 DETAILS

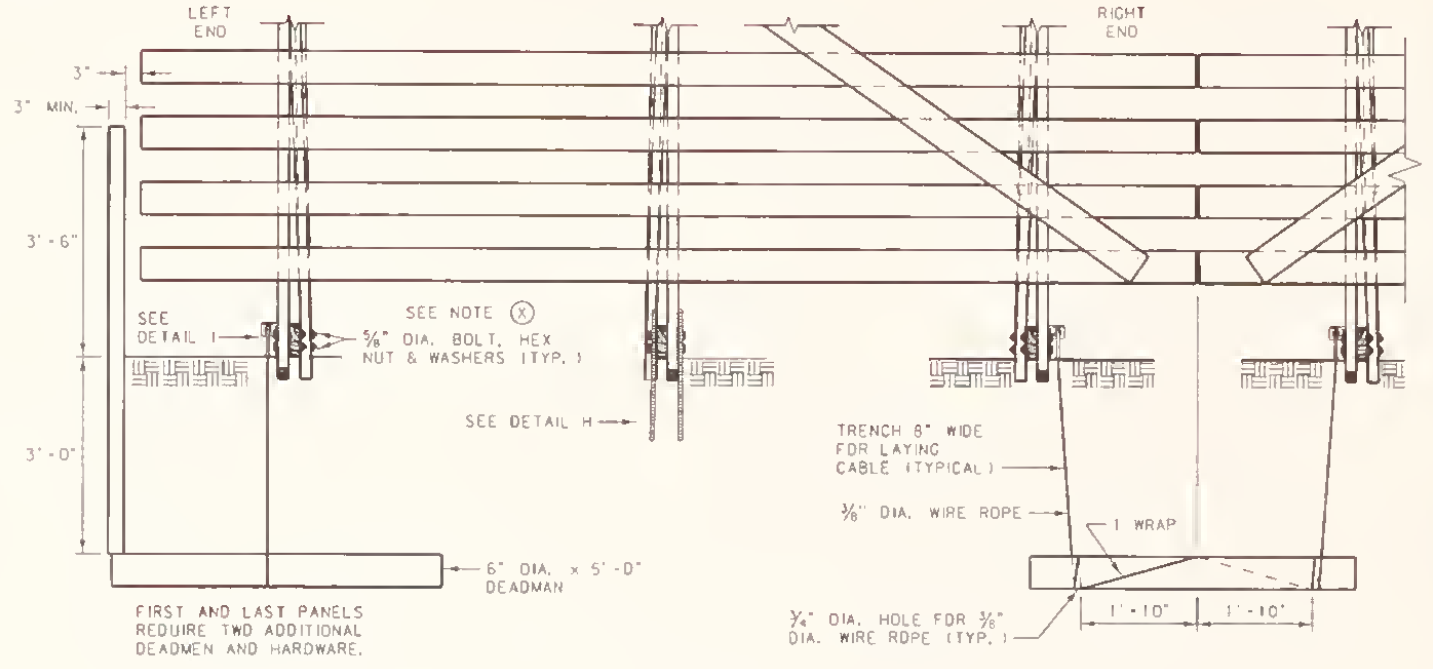
EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

ANCHOR SYSTEM #2
(FOR SWAMPY CONDITIONS)


52° 30
SEE DETAIL K
SEE DETAIL I
#6 REBAR (CENTER SUPPORT ONLY)
WRAP ⅜" DIA. WIRE ROPE AROUND 6" DIA. DEADMAN, RETURN, AND CLAMP WITH 2 ~ ⅜" WIRE ROPE CLIPS (END OF FIRST AND LAST PANEL ONLY)
SEE DETAIL J
SEE DETAIL I
3'-0"
3'-0"
3'-0"
3'-0"
6" DIA. × 5'-0" DEADMAN

LEFT END VIEW


LEFT END
RIGHT END
3"
3" MIN.
3'-6"
3'-0"
SEE DETAIL I
SEE NOTE ⓧ
⅝" DIA. BOLT, HEX NUT & WASHERS (TYP.)
SEE DETAIL H
TRENCH 8" WIDE FOR LAYING CABLE (TYPICAL)
⅜" DIA. WIRE ROPE
1 WRAP
6" DIA. × 5'-0" DEADMAN
FIRST AND LAST PANELS REQUIRE TWO ADDITIONAL DEADMEN AND HARDWARE.
¾" DIA. HOLE FOR ⅜" DIA. WIRE ROPE (TYP.)
1'-10"
1'-10"

FRONT VIEW

NOTE:
HOLES SHOWN IN DETAILS BELOW ARE FOR LEFT END OF FENCE.
HOLES SHOWN HIDDEN ARE FOR RIGHT END OF FENCE.

LUMBER - SNOW FENCE W/ ANCHOR SYSTEM #2
BILL OF MATERIALS FOR ONE PANEL
SAME AS FOR SNOW FENCE W/ ANCHOR SYSTEM #1

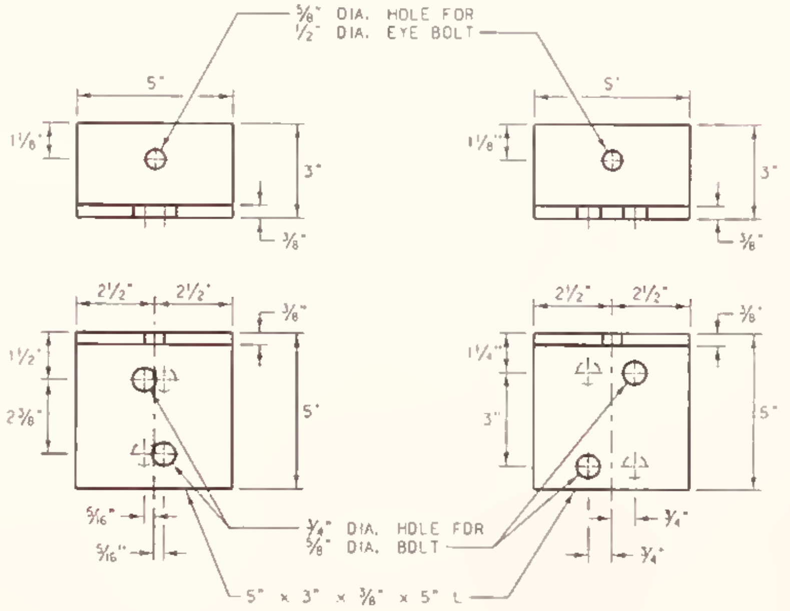
HARDWARE - SNOW FENCE W/ ANCHOR SYSTEM #2

BILL OF MATERIALS FOR ONE PANEL

QUANTITY	DESCRIPTION
4	5" × 3" × ⅜" × 5" L
8	⅜" WIRE CLAMPS
4	½" DIA. DROP FORCED EYEBOLTS W/ 3 HEX NUTS
4	FLAT WASHERS FOR ½" DIA. EYEBOLTS
4	#6 REBAR × 2'-0" (¾" DIA.)
4 PIECES	12 GAGE TIE WIRE × 2'-0" ±
29 FT.	⅜" DIA. WIRE ROPE
2	6" DIA. × 5'-0" POST DEADMEN
30	⅝" DIA. × 5" HEX BOLT (THREADED FULL LENGTH) AND NUT
60	FLAT WASHERS FOR ⅝" BOLT

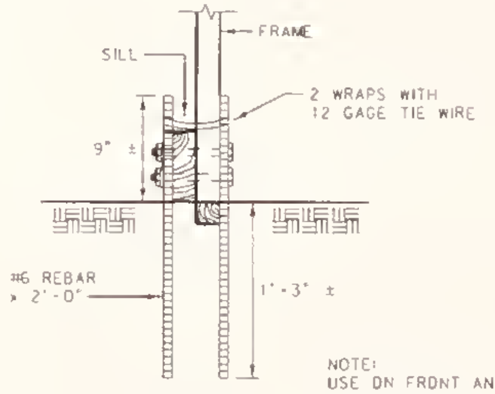
NOTE: NAILS REQUIRED ARE SAME AS SHOWN ON HARDWARE SUMMARY FOR SNOW FENCE W/ ANCHOR SYSTEM #1

ⓧ NOTE:
AFTER ⅝" DIA. BOLTS HAVE BEEN TIGHTENED, BURR THE THREAD DIRECTLY BEHIND THE NUT TO PREVENT EVENTUAL LOOSENING OF THE NUTS.



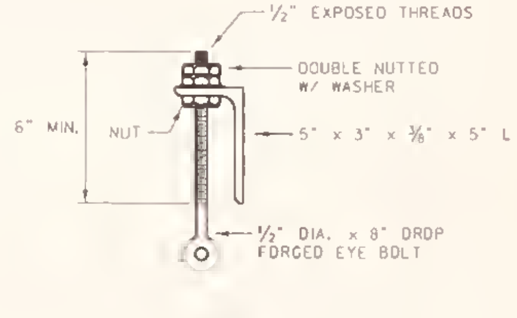
DETAIL J

DETAIL K

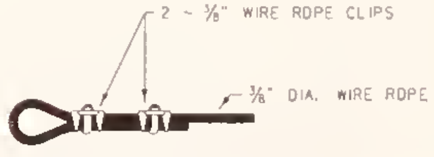


NOTE:
USE ON FRONT AND BACK OF CENTER SUPPORT.

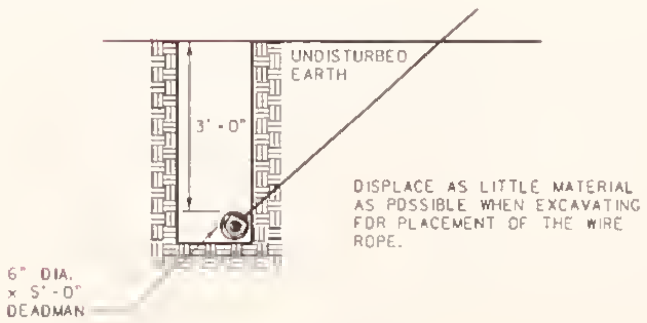
DETAIL H



DETAIL I



WIRE ROPE CONNECTION



DISPLACE AS LITTLE MATERIAL AS POSSIBLE WHEN EXCAVATING FOR PLACEMENT OF THE WIRE ROPE.

DEADMAN DETAIL

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 607
DWG. NO.
607-45

WOOD SNOW FENCE
ANCHOR SYSTEM #2 DETAILS

EFFECTIVE: AUGUST 1999

MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

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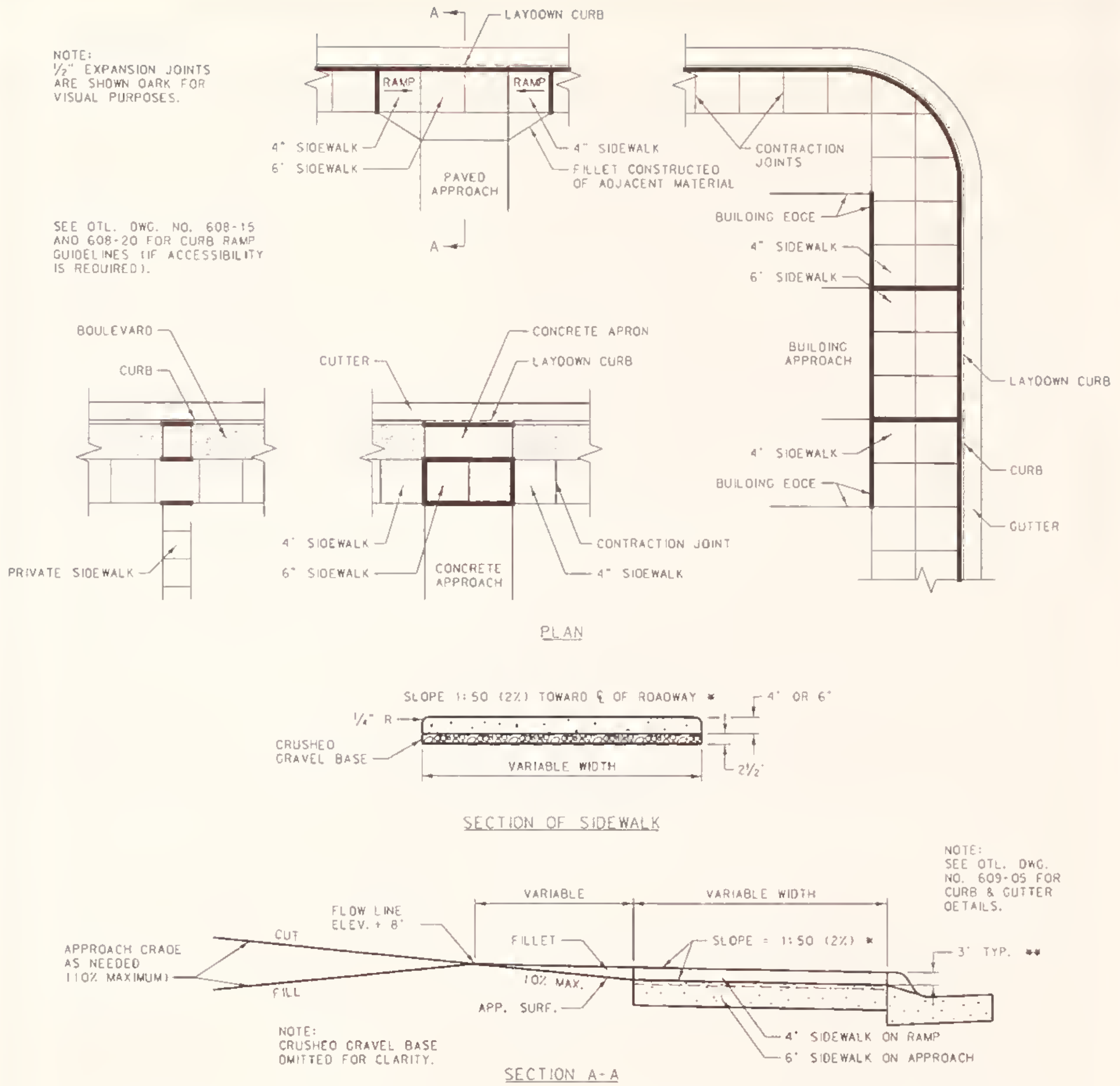


NOTE:
½" EXPANSION JOINTS ARE SHOWN DARK FOR VISUAL PURPOSES.

SEE DTL. DWG. NO. 608-15 AND 608-20 FOR CURB RAMP GUIDELINES (IF ACCESSIBILITY IS REQUIRED).

NOTE:
SEE DTL. DWG. NO. 609-05 FOR CURB & GUTTER DETAILS.

NOTE:
CRUSHED GRAVEL BASE OMITTED FOR CLARITY.

NOTES:

INSTALL PREFORMED EXPANSION JOINT FILLER, STD. SPEC. 707.01.3, AT ALL EXPANSION JOINTS, FOR THE FULL THICKNESS OF THE SIDEWALK AND USE AT ALL JOINTS BETWEEN NEW CONCRETE SIDEWALK AND STRUCTURES IN PLACE.

ALL JOINTS MUST BE STRAIGHT AND PERPENDICULAR TO THE CENTERLINE AND THE SURFACE OF THE SIDEWALK. WHERE PRACTICABLE, ALIGN ALL JOINTS WITH LIKE JOINTS IN ADJOINING WORK. USE JOINTS TO OUTLINE ALL PANELS IN THE SIDEWALK, WHICH ARE TO BE, SO FAR AS POSSIBLE, SQUARE. THE LENGTHS OF THE PANELS ARE DETERMINED BY THE WIDTH OF THE SIDEWALK.

WHERE RIGHT-OF-WAY PERMITS, NEW SIDEWALKS LESS THAN 5 FEET IN WIDTH MUST HAVE A PASSING AREA AT A MAXIMUM SPACING OF 200 FEET. THE PASSING AREA IS A MINIMUM OF 5 FEET BY FEET IN SIZE.

CONTRACTION JOINTS MAY NOT BE MORE THAN ⅛" WIDE AND NOT LESS THAN 1" IN DEPTH AND MAY BE CUT BY A GROOVE FORMING TOOL.

LOCATE EXPANSION JOINTS AT INTERVALS EQUAL TO THE NEAREST MULTIPLE OF THE CONTRACTION JOINT INTERVAL, BUT NOT GREATER THAN 60 FEET.

USE A LONGITUDINAL CONTRACTION JOINT IN THE CENTERLINE OF ALL SIDEWALKS WIDER THAN 5 FEET.

* THE MAXIMUM CROSS SLOPE OF THE SIDEWALK IS 1:50 (2%).

** THIS DEPTH IS STANDARD IN NEW CONSTRUCTION. ALTERATIONS TO EXISTING FACILITIES MAY RESULT IN A LARGER DEPTH, WHICH WILL REQUIRE A GREATER RAMP LENGTH.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 608
DWG. NO.
608-05

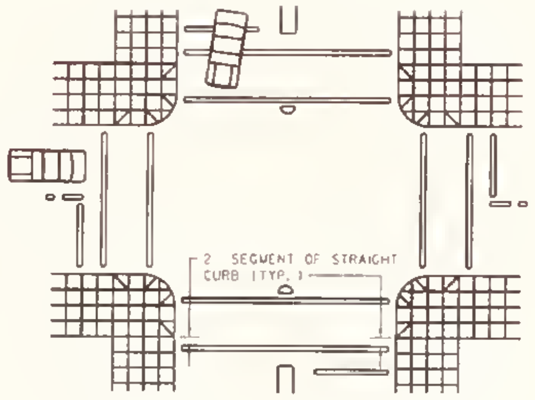
CONCRETE SIDEWALK

EFFECTIVE: AUGUST 1999

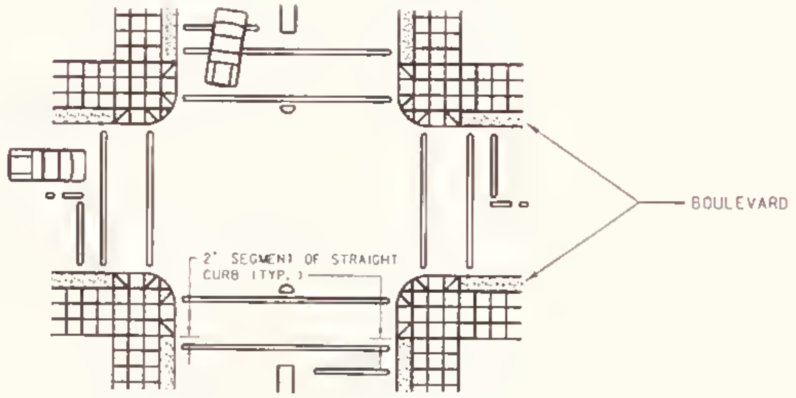
MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

CURB RAMPS AT MARKED CROSSINGS

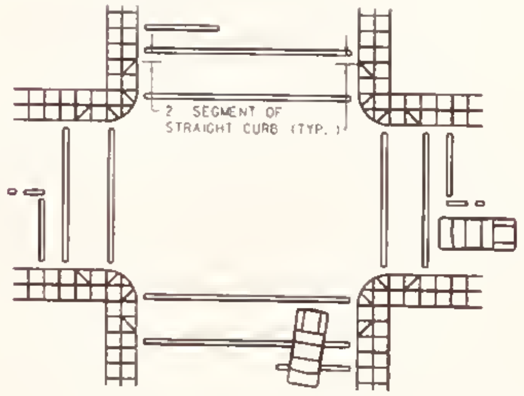
ILLUSTRATED WITH OPTION A (SEE NOTE 1)



TYPICAL URBAN SITE - WIDE SIDEWALKS WITH MEDIAN ISLANDS DEPRESSED

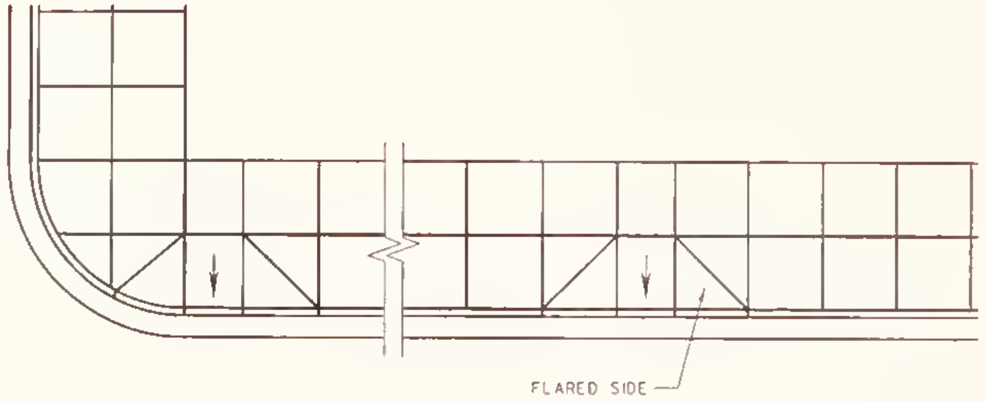


TYPICAL URBAN SITE - WIDE SIDEWALKS WITH MEDIAN ISLANDS DEPRESSED (INCLUDES BOULEVARD AREA)



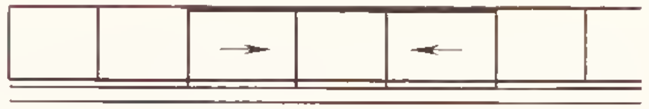
TYPICAL RESIDENTIAL SITE - NARROWER SIDEWALKS (MAY INCLUDE BOULEVARD - NOT SHOWN)

CURB RAMP TYPES



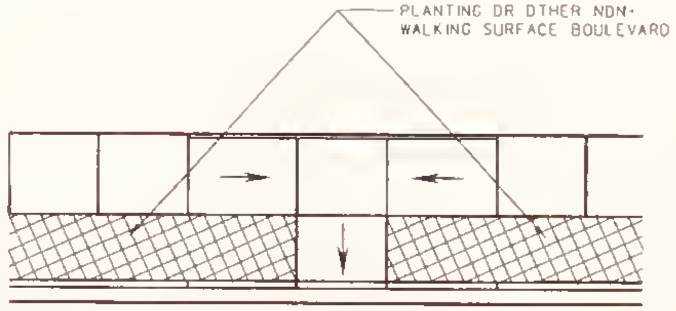
(A)

PERPENDICULAR PUBLIC SIDEWALK CURB RAMP (SEE DETAILED DRAWING NUMBER 608-25 FOR ADDITIONAL DETAILS)



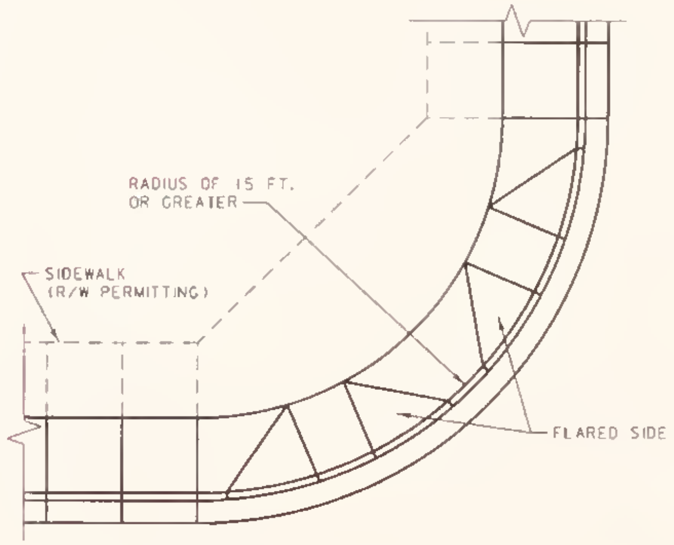
(B)

PARALLEL PUBLIC SIDEWALK CURB RAMP (SEE DETAILED DRAWING NUMBER 608-30 FOR ADDITIONAL DETAILS)



(C)

COMBINED (PARALLEL/PERPENDICULAR) PUBLIC SIDEWALK CURB RAMP (SEE DETAILED DRAWING NUMBERS 608-25 AND 608-30 FOR ADDITIONAL DETAILS)



(D)

DIAGONAL PUBLIC SIDEWALK CURB RAMP (SEE DETAILED DRAWING NUMBER 608-35 FOR ADDITIONAL DETAILS)

GENERAL NOTES:

1. IN NEW CONSTRUCTION, USE PUBLIC SIDEWALK CURB RAMPS IN THE FOLLOWING ORDER OF PREFERENCE:
   - A. PERPENDICULAR PUBLIC SIDEWALK CURB RAMP
   - B. PARALLEL PUBLIC SIDEWALK CURB RAMP
   - C. COMBINED (PARALLEL/PERPENDICULAR) PUBLIC SIDEWALK CURB RAMP
   - D. DIAGONAL PUBLIC SIDEWALK CURB RAMP.

   SINGLE DIAGONAL OR DEPRESSED CORNER PUBLIC SIDEWALK CURB RAMPS SERVING TWO STREET CROSSING DIRECTIONS ARE NOT PERMITTED IN NEW CONSTRUCTION.

2. WHEN ALTERING EXISTING FACILITIES, MEET NEW CONSTRUCTION REQUIREMENTS FOR PUBLIC SIDEWALK CURB RAMPS TO THE MAXIMUM EXTENT FEASIBLE.

3. IF POSSIBLE, DO NOT PLACE DRAINAGE STRUCTURES IN CONFLICT WITH PUBLIC SIDEWALK CURB RAMPS. LOCATION OF CURB RAMPS TAKES PRECEDENCE OVER LOCATION OF DRAINAGE STRUCTURES EXCEPT WHERE EXISTING DRAINAGE STRUCTURES ARE BEING UTILIZED.

4. USE THE FLATTEST SLOPES POSSIBLE FOR ALL CURB RAMPS. MAXIMUM SLOPES ARE SHOWN FOR GUIDANCE AT DIFFICULT SITES.

5. FINAL FIELD LOCATION OF THE CURB RAMPS WILL BE DETERMINED BY THE ENGINEER.

6. FOR ADDITIONAL INFORMATION CONSULT:

   APPENDIX IV
   AMERICANS WITH DISABILITIES ACT (ADA)
   ACCESSIBILITY GUIDELINES FOR BUILDINGS AND FACILITIES
   AUGUST 1994 EDITION

CONSTRUCTION REQUIREMENTS:

1. OBTAIN A SURFACE TEXTURE ON THE RAMP BY COARSE BROOMING, TRANSVERSE TO THE RAMP SLOPE.

2. TAKE CARE DURING CONSTRUCTION TO ASSURE UNIFORM RAMP GRADES, FREE OF SAGS AND SHARP GRADE CHANGES.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 608
DWG. NO.
608-15

NEW CONSTRUCTION
PUBLIC SIDEWALK
CURB RAMPS

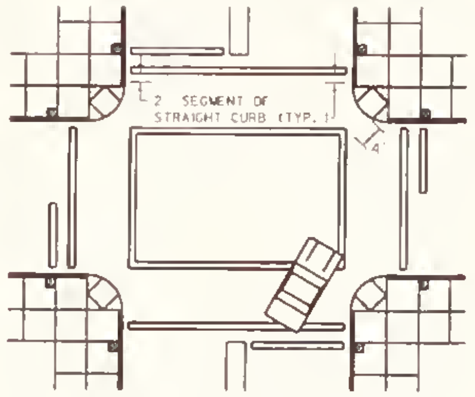
EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

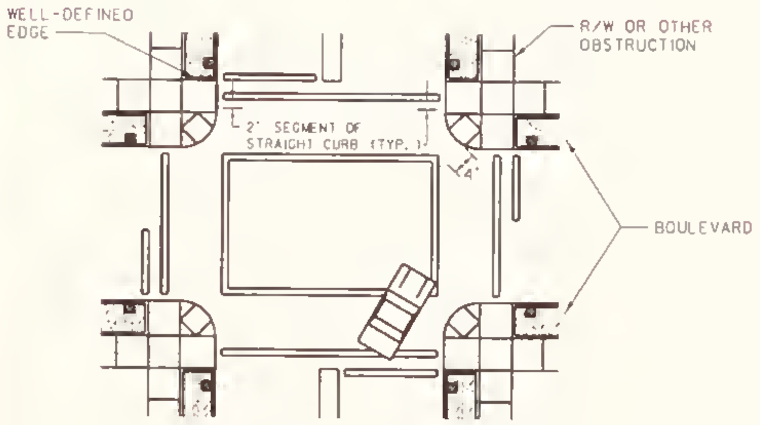
CURB RAMPS AT MARKED INTERSECTIONS

ILLUSTRATED WITH OPTION E (SEE NOTE 1)

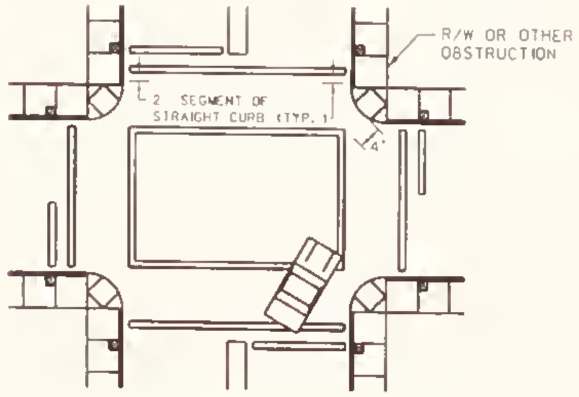
FOLLOW NEW CONSTRUCTION GUIDELINES ON DETAILED DRAWING NUMBER 608-15 UNLESS EXISTING OBSTRUCTIONS CAUSE USE OF THE DIAGONAL PUBLIC SIDEWALK CURB RAMP.



TYPICAL URBAN SITE - EXISTING OBSTRUCTIONS PREVENT USE OF OTHER CURB RAMP TYPES



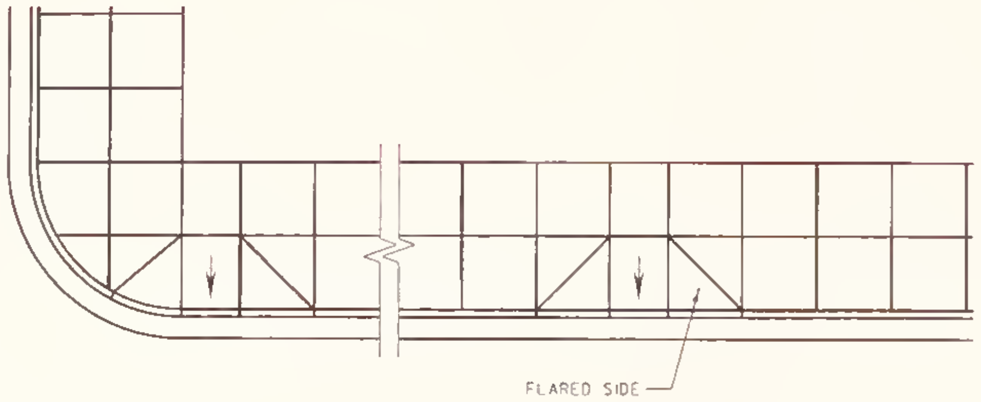
TYPICAL SITE - EXISTING RIGHT-OF-WAY OR OTHER OBSTRUCTIONS PREVENT USE OF OTHER CURB RAMP TYPES (SHOWN WITH BOULEVARD)



TYPICAL SITE - EXISTING RIGHT-OF-WAY OR OTHER OBSTRUCTIONS PREVENT USE OF OTHER CURB RAMP TYPES

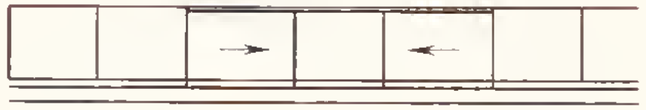
▨ - OBSTRUCTION

CURB RAMP TYPES



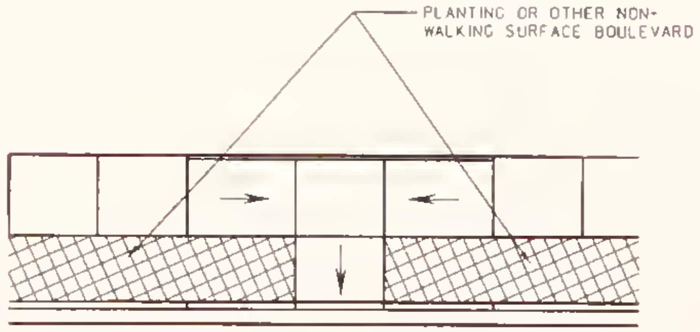
(A)

PERPENDICULAR PUBLIC SIDEWALK CURB RAMP (SEE DETAILED DRAWING NUMBER 608-25 FOR ADDITIONAL DETAILS)



(B)

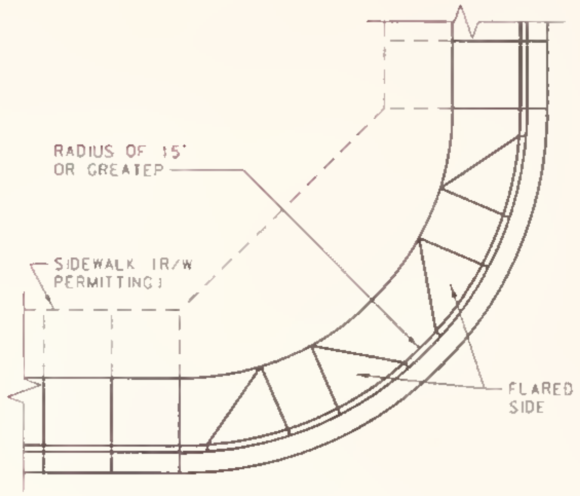
PARALLEL PUBLIC SIDEWALK CURB RAMP (SEE DETAILED DRAWING NUMBER 608-30 FOR ADDITIONAL DETAILS)



(C)

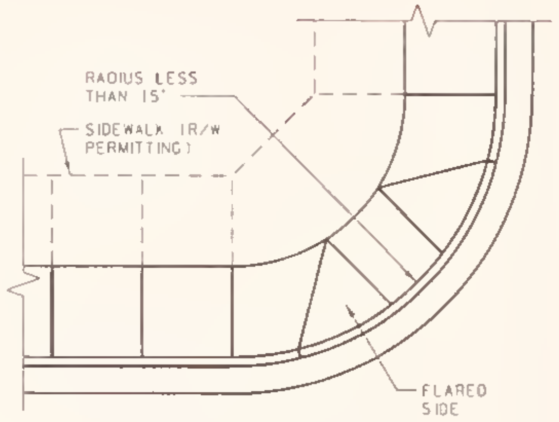
COMBINED (PARALLEL/PERPENDICULAR) PUBLIC SIDEWALK CURB RAMP (SEE DETAILED DRAWING NUMBERS 608-25 AND 608-30 FOR ADDITIONAL DETAILS)

CURB RAMP TYPES



(D)

DIAGONAL PUBLIC SIDEWALK CURB RAMP (SEE DETAILED DRAWING NUMBER 608-35 FOR ADDITIONAL DETAILS)



(E)

SINGLE DIAGONAL PUBLIC SIDEWALK CURB RAMP (SEE DETAILED DRAWING NUMBER 608-35 FOR ADDITIONAL DETAILS)

GENERAL NOTES:

1. WHEN ALTERING EXISTING FACILITIES, USE PUBLIC SIDEWALK CURB RAMPS IN THE FOLLOWING ORDER OF PREFERENCE:

   A. PERPENDICULAR PUBLIC SIDEWALK CURB RAMP
   B. PARALLEL PUBLIC SIDEWALK CURB RAMP
   C. COMBINED (PARALLEL/PERPENDICULAR) PUBLIC SIDWALK CURB RAMP
   D. DIAGONAL PUBLIC SIDEWALK CURB RAMP
   E. SINGLE DIAGONAL PUBLIC SIDEWALK CURB RAMP

   NOTE: USE DIAGONAL PUBLIC SIDEWALK CURB RAMPS AS THE LAST OPTION AND CONSTRUCT TO COMPLY WITH ALL ADA SLOPE AND CONSTRUCTION CRITERIA TO THE GREATEST EXTENT POSSIBLE.

2. PLACE CURB RAMPS TO AVOID EXISTING DRAINAGE STRUCTURES AND OTHER OBSTRUCTIONS TO THE GREATEST EXTENT POSSIBLE.

3. USE THE FLATTEST SLOPES POSSIBLE FOR ALL CURB RAMPS. MAXIMUM SLOPES ARE SHOWN FOR GUIDANCE AT DIFFICULT SITES AND SHOULD BE AVOIDED IF POSSIBLE.

4. FINAL FIELD LOCATION OF THE CURB RAMPS WILL BE DETERMINED BY THE ENGINEER.

5. FOR ADDITIONAL INFORMATION CONSULT:

   APPENDIX IV
   AMERICANS WITH DISABILITIES ACT (ADA)
   ACCESSIBILITY GUIDELINES FOR BUILDINGS AND FACILITIES
   AUGUST, 1994 EDITION

CONSTRUCTION REQUIREMENTS:

1. OBTAIN A SURFACE TEXTURE ON THE RAMP BY COARSE BROOMING, TRANSVERSE TO THE RAMP SLOPE.

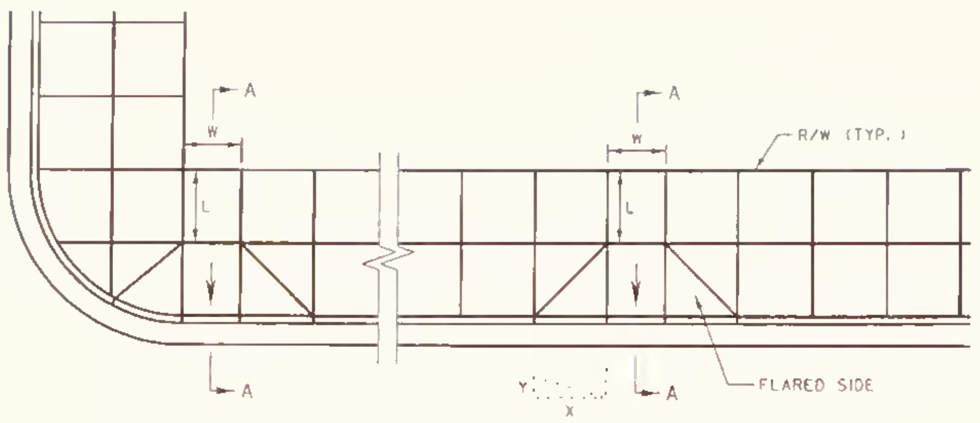
2. TAKE CARE DURING CONSTRUCTION TO ASSURE UNIFORM RAMP GRADES, FREE OF SAGS AND SHARP GRADE CHANGES.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 608
DWG. NO.
608-20

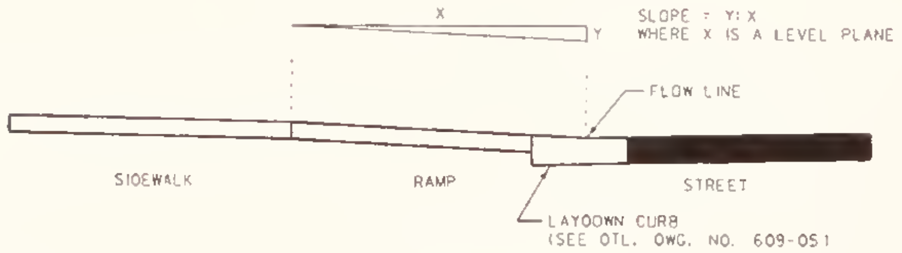
ALTERATIONS TO EXISTING
FACILITIES - PUBLIC
SIDEWALK CURB RAMPS

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



PERPENDICULAR PUBLIC SIDEWALK CURB RAMP



SECTION A-A

NEW CONSTRUCTION REQUIREMENTS:

1. THE DESIRABLE WIDTH OF THE CURB RAMP (DIMENSION "W" ABOVE) IS 4 FEET OR WIDER. THE MINIMUM WIDTH (W) IS 3 FEET.
2. THE DESIRABLE LENGTH OF THE LANDING AT THE TOP OF THE CURB RAMP (DIMENSION "L" ABOVE) IS 5 FEET OR THE LENGTH OF THE RAMP. THE MINIMUM LENGTH "L" IS 4 FEET.
3. THE DESIRABLE SLOPE FOR THE CURB RAMP IS 1:20 OR FLATTER. THE MAXIMUM CURB RAMP SLOPE IS 1:12.
4. THE DESIRABLE SLOPE FOR THE FLARED SIDE OF THE CURB RAMP IS 1:12 OR FLATTER. THE MAXIMUM FLARED SIDE SLOPE IS 1:10.
5. THE MAXIMUM CROSS SLOPE OF THE SIDEWALK IS 1:50 (2%).
6. THE SURFACE OF THE PERPENDICULAR PUBLIC SIDEWALK CURB RAMP IS TO CONTRAST VISUALLY WITH THE ADJOINING PUBLIC SIDEWALK SURFACES. THIS CAN BE OBTAINED BY USE OF COLORED CONCRETE, PATTERNING THE CONCRETE SURFACE OR OTHER APPROVED METHODS.

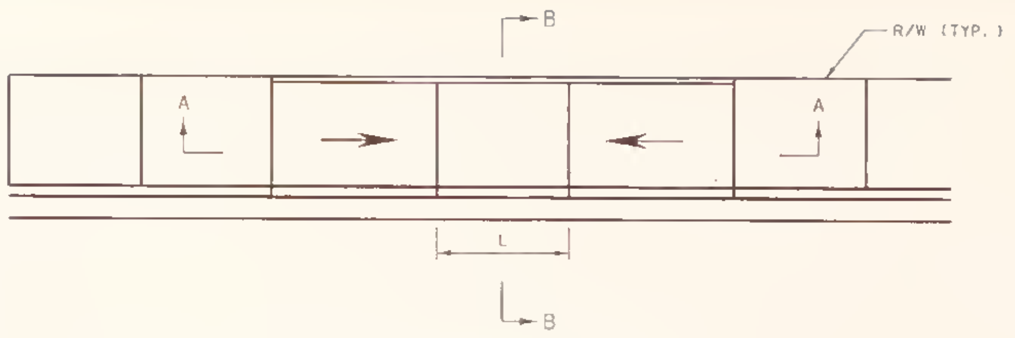
REQUIREMENTS FOR ALTERATIONS TO EXISTING FACILITIES:

NOTE: WHEREVER POSSIBLE, ALTER EXISTING FACILITIES TO COMPLY WITH THE NEW CONSTRUCTION REQUIREMENTS.

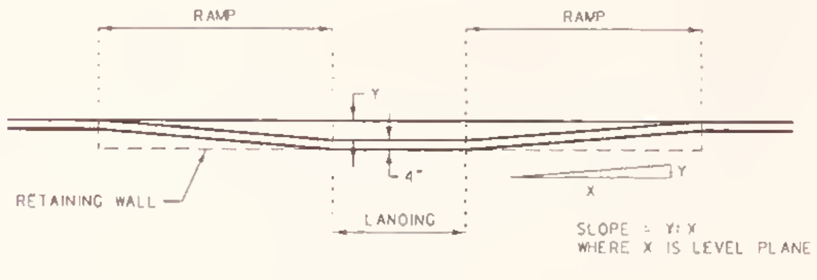
1. THE MINIMUM WIDTH OF THE CURB RAMP (DIMENSION "W" ABOVE) IS 3 FEET.
   NOTE: WHERE THE PUBLIC PEDESTRIAN RIGHT-OF-WAY WIDTH IS LESS THAN 3 FEET, PROVIDE A PARALLEL PUBLIC SIDEWALK CURB RAMP.
2. WHERE PUBLIC PEDESTRIAN RIGHT-OF-WAY WIDTH IS INSUFFICIENT TO ACCOMMODATE A TOP LANDING OF 4 FEET, PROVIDE A TOP LANDING OF 3 FEET.
3. THE MAXIMUM CURB RAMP SLOPE IS 1:10, PROVIDED THE RISE (DIMENSION "Y" ABOVE) IS 6 INCHES OR LESS. A 1:12 OR FLATTER SLOPE IS DESIRABLE.
4. THE MAXIMUM FLARED SIDE SLOPE IS 1:10.
5. THE MAXIMUM CROSS SLOPE OF THE SIDEWALK IS 1:50 (2%).
6. THE SURFACE OF THE PERPENDICULAR PUBLIC SIDEWALK CURB RAMP IS TO CONTRAST VISUALLY WITH THE ADJOINING PUBLIC SIDEWALK SURFACES. THIS CAN BE OBTAINED BY USE OF COLORED CONCRETE, PATTERNING THE CONCRETE SURFACE OR OTHER APPROVED METHODS.
7. WHERE EXISTING SITE DEVELOPMENT CONDITIONS PROHIBIT THE STRICT AND FULL COMPLIANCE OF ALL ADA CRITERIA, PROVIDE ACCESSIBILITY TO THE MAXIMUM EXTENT FEASIBLE.

NOTE:
COMBINED (PARALLEL/PERPENDICULAR) PUBLIC SIDEWALK CURB RAMPS ARE TO MEET THE CRITERIA FOR BOTH THE PARALLEL AND PERPENDICULAR PUBLIC SIDEWALK CURB RAMPS. (SEE DETAILED DRAWING NUMBER 608-30 AND THIS DRAWING.)

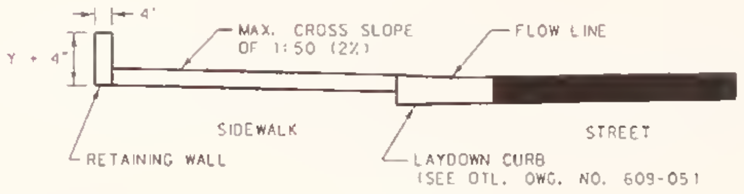
DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 608
DWG. NO.
608-25
PERPENDICULAR
PUBLIC SIDEWALK
CURB RAMPS
EFFECTIVE: AUGUST 1999
MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



PARALLEL PUBLIC SIDEWALK CURB RAMP



SECTION A-A



SECTION B-B

NEW CONSTRUCTION REQUIREMENTS:

1. THE MINIMUM LENGTH OF THE LANDING (DIMENSION "L" ABOVE) IS 5 FEET.
2. THE DESIRABLE SLOPE FOR THE CURB RAMPS IS 1:20 OR FLATTER. THE MAXIMUM CURB RAMP SLOPE IS 1:12.
3. THE MAXIMUM CROSS SLOPE OF THE SIDEWALK OR LANDING IS 1:50 (2%).
4. THE SURFACE OF THE LANDING IS TO CONTRAST VISUALLY WITH ADJOINING PUBLIC SIDEWALK SURFACES. THIS CAN BE OBTAINED BY USE OF COLORED CONCRETE, PATTERNING THE CONCRETE SURFACE OR OTHER APPROVED METHODS.

REQUIREMENTS FOR ALTERATIONS TO EXISTING FACILITIES:

NOTE: WHEREVER POSSIBLE, ALTER EXISTING FACILITIES TO COMPLY WITH THE NEW CONSTRUCTION REQUIREMENTS.

1. THE DESIRABLE LENGTH OF THE LANDING (DIMENSION "L" ABOVE) IS 5 FEET. THE MINIMUM LANDING LENGTH IS 4 FEET.
2. THE MAXIMUM CURB RAMP SLOPE IS 1:10, PROVIDED THE RISE (DIMENSION "Y" ABOVE) IS 6 INCHES OR LESS. A 1:12 OR FLATTER SLOPE IS DESIRABLE.
3. THE MAXIMUM CROSS SLOPE OF THE SIDEWALK AND LANDING IS 1:50 (2%) SLOPE.
4. THE SURFACE OF THE LANDING IS TO CONTRAST VISUALLY WITH THE ADJOINING PUBLIC SIDEWALK SURFACES. THIS CAN BE OBTAINED BY USE OF COLORED CONCRETE, PATTERNING THE CONCRETE SURFACE OR OTHER APPROVED METHODS.
5. WHERE EXISTING SITE DEVELOPMENT CONDITIONS PROHIBIT THE STRICT AND FULL COMPLIANCE OF ALL ADA CRITERIA, PROVIDE ACCESSIBILITY TO THE MAXIMUM EXTENT FEASIBLE.

NOTES:

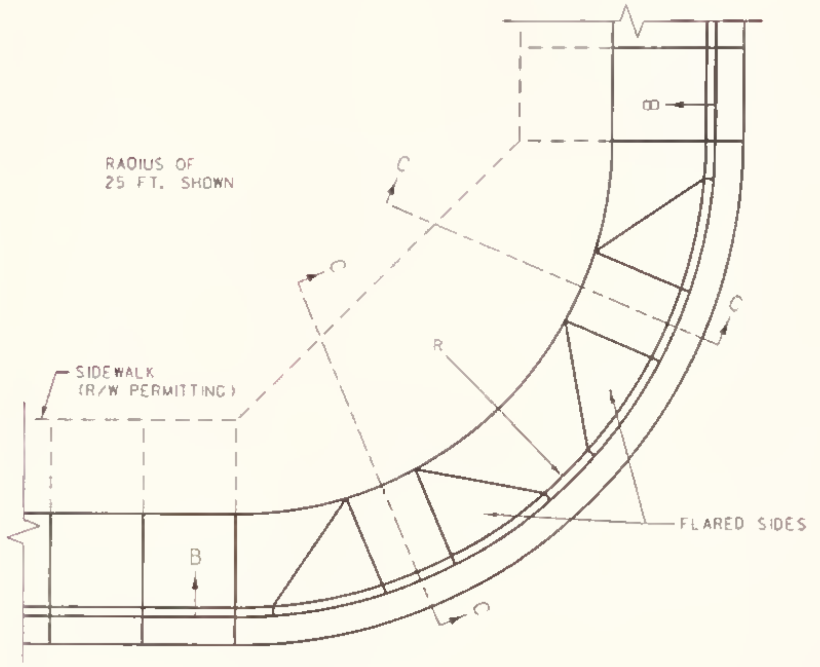
THE COST OF THE RETAINING WALL IS INCLUDED IN THE UNIT PRICE BID FOR CONCRETE SIDEWALK.

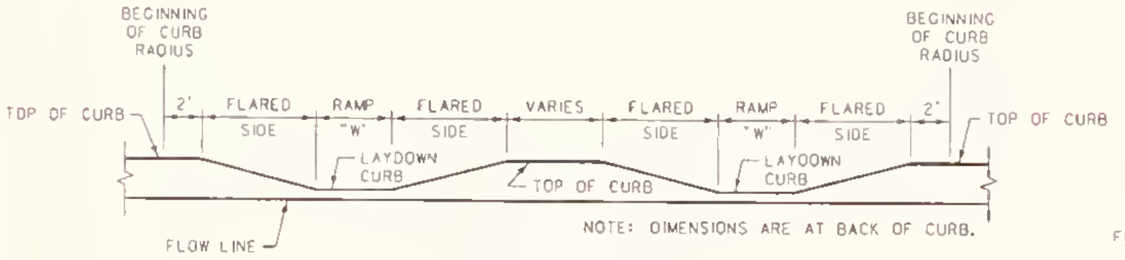
COMBINED (PARALLEL/PERPENDICULAR) PUBLIC SIDEWALK CURB RAMPS ARE TO MEET THE CRITERIA FOR BOTH THE PARALLEL AND PERPENDICULAR PUBLIC SIDEWALK CURB RAMPS. (SEE DETAILED DRAWING NO. 608-25 AND THIS DRAWING.)

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 608
DWG. NO.
608-30
PARALLEL
PUBLIC SIDEWALK
CURB RAMPS
EFFECTIVE: AUGUST 1999
MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

DIAGONAL PUBLIC SIDEWALK CURB RAMP

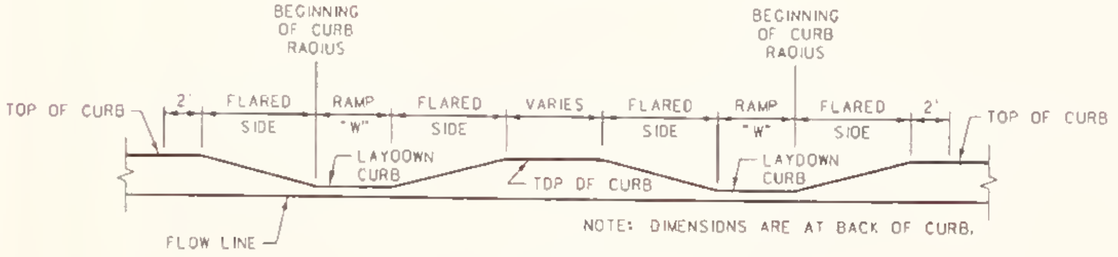
(FOR RADII 15 FT. OR GREATER)





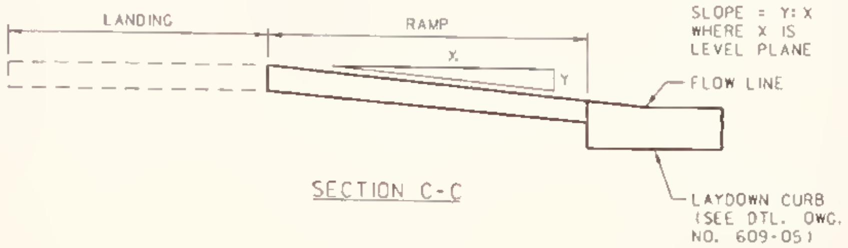
SECTION B-B

(R EQUAL TO OR GREATER THAN 25')



SECTION B-B

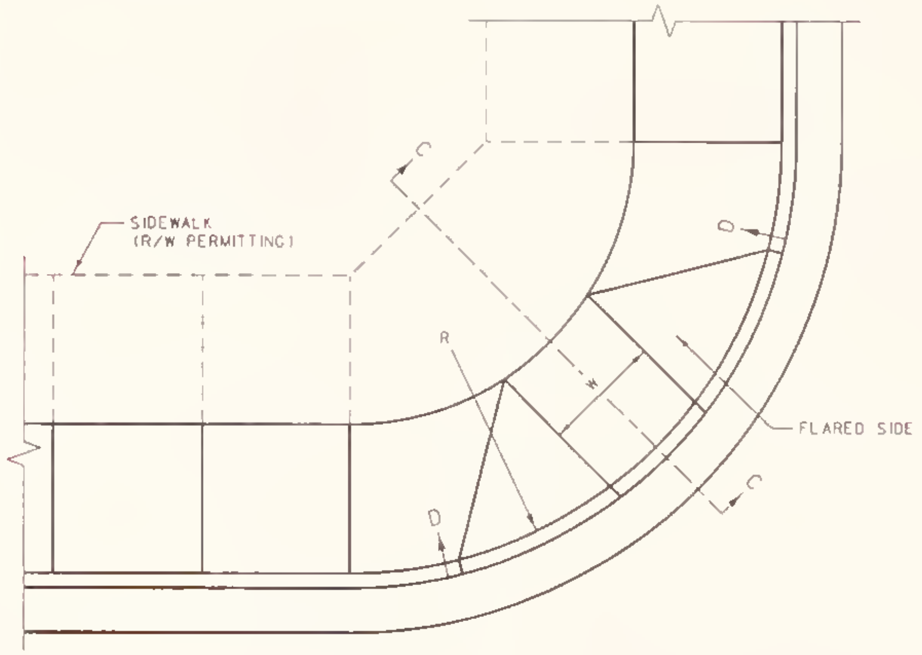
(R EQUAL TO OR GREATER THAN 15', BUT LESS THAN 25')

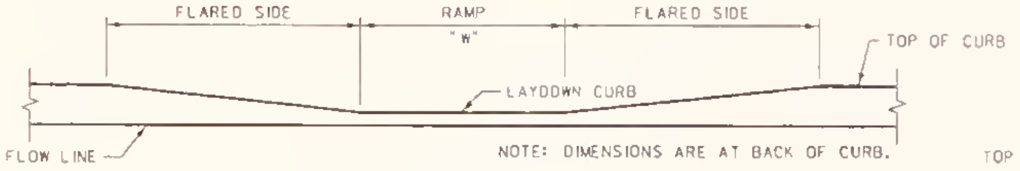


SECTION C-C

SINGLE DIAGONAL PUBLIC SIDEWALK CURB RAMP

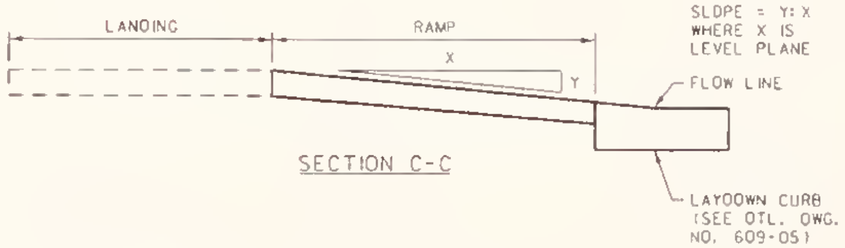
(FOR RADII LESS THAN 15 FT.)





SECTION D-D

(R LESS THAN 15')



SECTION C-C

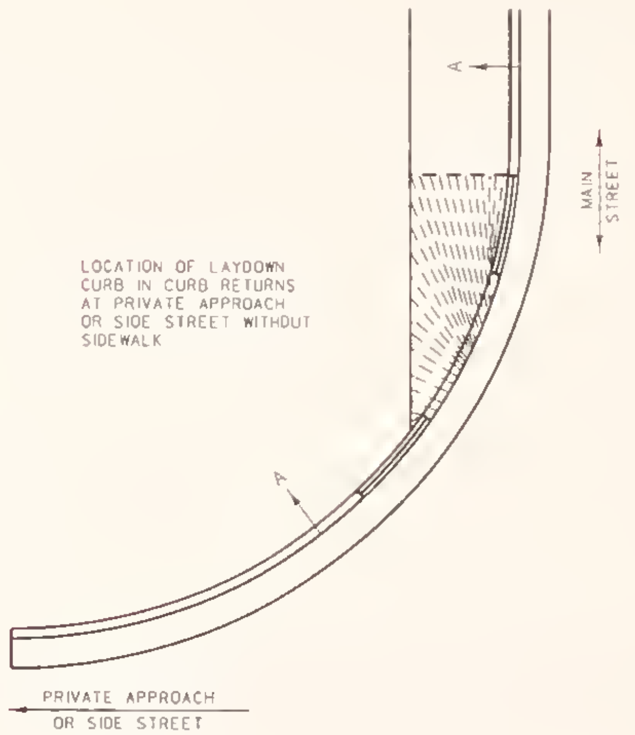
NEW CONSTRUCTION:

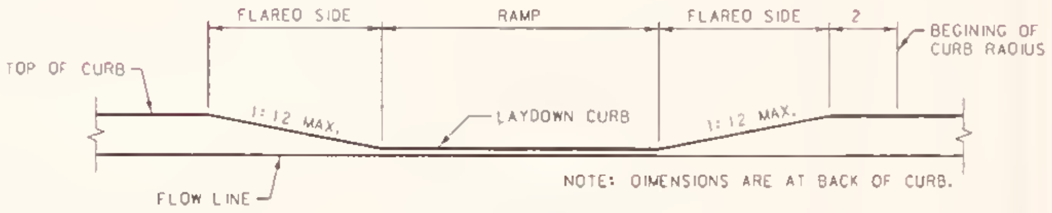
NOTE: SINGLE DIAGONAL PUBLIC SIDEWALK CURB RAMPS SERVING TWO STREET CROSSING DIRECTIONS ARE NOT PERMITTED IN NEW CONSTRUCTION.

REQUIREMENTS FOR ALTERATIONS TO EXISTING FACILITIES:

1. THE DESIRABLE WIDTH OF THE CURB RAMP (DIMENSION "W" ABOVE) IS 4 FEET. THE MINIMUM WIDTH IS 3 FEET.
2. THE DESIRABLE CURB RAMP SLOPE IS 1:12 OR FLATTER. THE MAXIMUM CURB RAMP SLOPE IS 1:10, PROVIDED THE RISE (DIMENSION "Y" ABOVE) IS 6 INCHES OR LESS.
3. THE DESIRABLE LANDING LENGTH IS 4 FEET. THE MINIMUM LANDING LENGTH IS 3 FEET.
   NOTE: IF EXISTING RIGHT-OF-WAY OR OTHER OBSTRUCTIONS REDUCE THE LANDING LENGTH TO LESS THAN 4 FEET, THE MAXIMUM FLARED SIDE SLOPE IS 1:12.
4. THE MAXIMUM FLARED SIDE SLOPE IS 1:10.
5. THE MAXIMUM CROSS SLOPE OF THE SIDEWALK IS 1:50 (2%).
6. THE SURFACE OF THE PUBLIC SIDEWALK RAMP IS TO CONTRAST VISUALLY WITH THE ADJOINING PUBLIC SIDEWALK SURFACES. THIS CAN BE OBTAINED BY USE OF COLORED CONCRETE, PATTERNING THE CONCRETE SURFACE OR OTHER APPROVED METHODS.
7. WHERE EXISTING SITE DEVELOPMENT CONDITIONS PROHIBIT THE STRICT AND FULL COMPLIANCE OF ALL ADA CRITERIA, PROVIDE ACCESSIBILITY TO THE MAXIMUM EXTENT FEASIBLE.

PRIVATE APPROACH SIDEWALK CURB RAMP





SECTION A-A

DETAILED DRAWING

REFERENCE	DWG. NO.
STANDARD SPEC. SECTION 608	608-35

DIAGONAL PUBLIC
SIDEWALK CURB RAMPS

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT
OF TRANSPORTATION

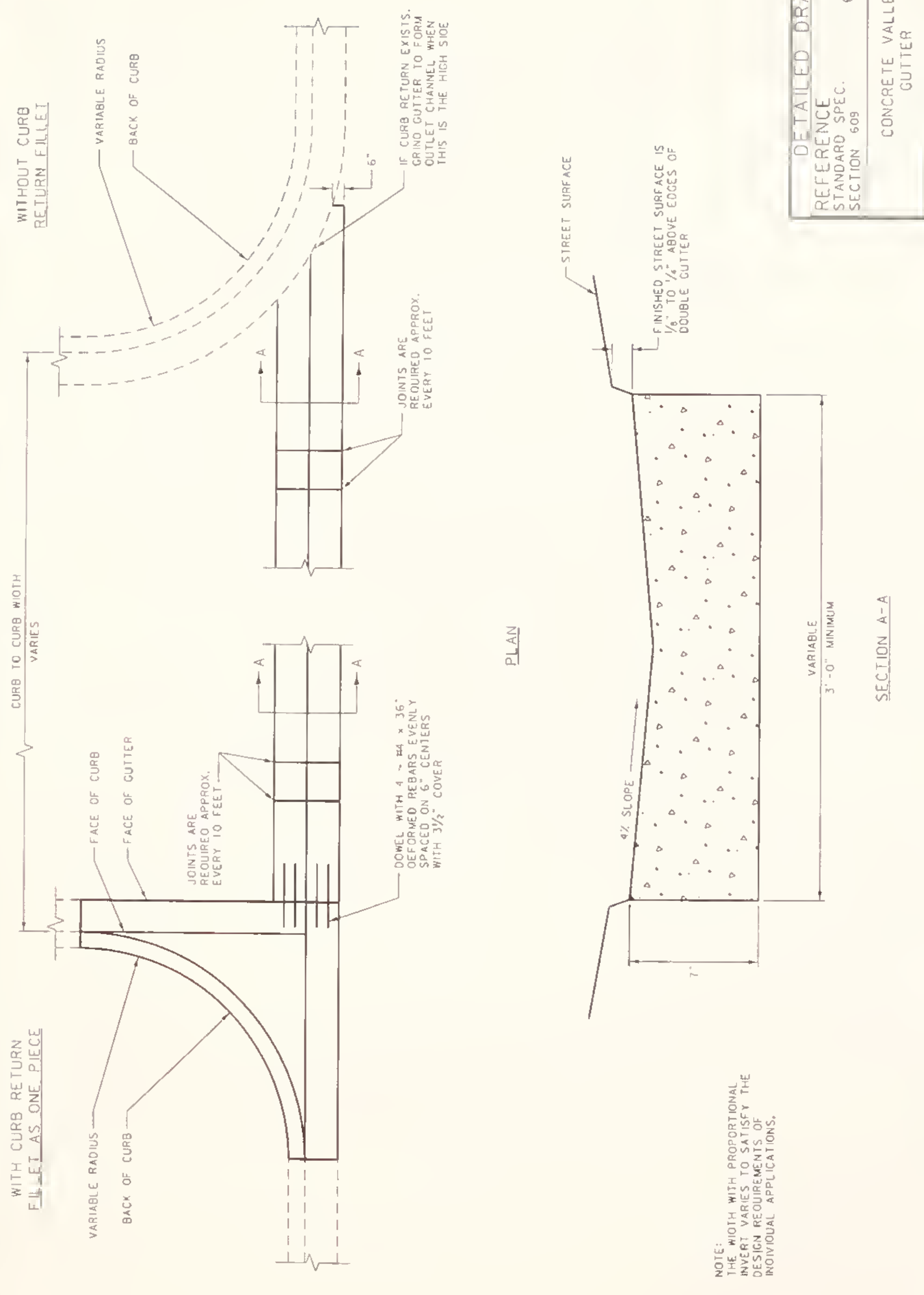
MONTANA
CADD

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 609
DWG. NO.
609-00

CONCRETE VALLEY GUTTER

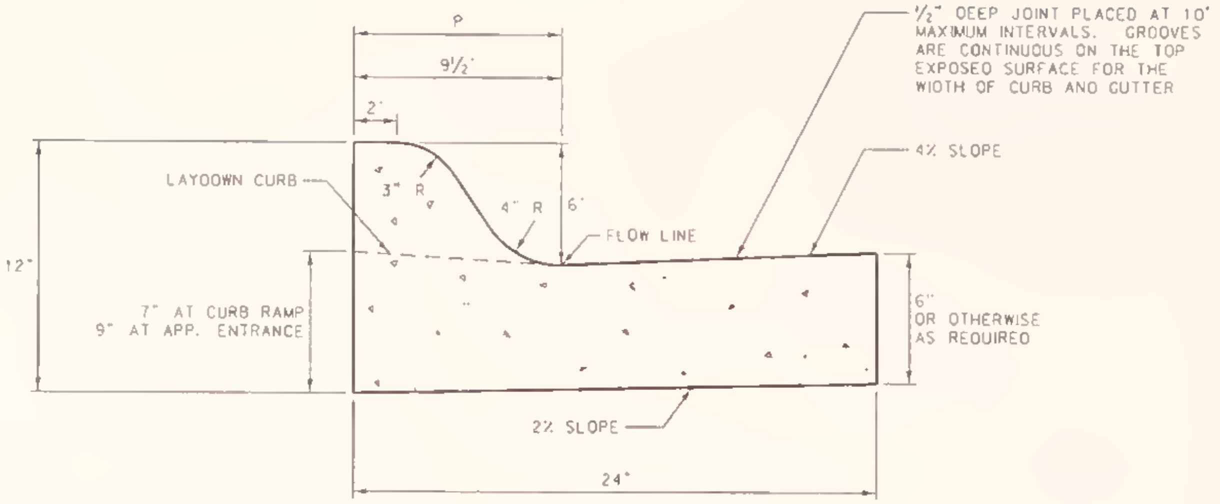
EFFECTIVE: AUGUST 1999

MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD


WITHOUT CURB RETURN FILLET
VARIABLE RADIUS
BACK OF CURB
IF CURB RETURN EXISTS, GRIND GUTTER TO FORM OUTLET CHANNEL WHEN THIS IS THE HIGH SIDE
6"
JOINTS ARE REQUIRED APPROX. EVERY 10 FEET
A
A
CURB TO CURB WIDTH VARIES
FACE OF CURB
FACE OF GUTTER
JOINTS ARE REQUIRED APPROX. EVERY 10 FEET
DOWEL WITH 4 - #4 × 36" DEFORMED REBARS EVENLY SPACED ON 6" CENTERS WITH 3½" COVER
WITH CURB RETURN FILLET AS ONE PIECE
VARIABLE RADIUS
BACK OF CURB
PLAN
STREET SURFACE
FINISHED STREET SURFACE IS 1/8" TO 1/4" ABOVE EDGES OF DOUBLE GUTTER
4% SLOPE
VARIABLE
3'-0" MINIMUM
7"
SECTION A-A

NOTE:
THE WIDTH WITH PROPORTIONAL INVERT VARIES TO SATISFY THE DESIGN REQUIREMENTS OF INDIVIDUAL APPLICATIONS.

CONCRETE CURBS


P
9½"
2"
LAYDOWN CURB
3" R
4" R
6"
FLOW LINE
½" DEEP JOINT PLACED AT 10' MAXIMUM INTERVALS. GROOVES ARE CONTINUOUS ON THE TOP EXPOSED SURFACE FOR THE WIDTH OF CURB AND GUTTER
4% SLOPE
12"
7" AT CURB RAMP
9" AT APP. ENTRANCE
6" OR OTHERWISE AS REQUIRED
2% SLOPE
24"

P = AREA TO BE PAINTED, WHEN PAINTED CURB IS REQUIRED

CURB & GUTTER SECTION
0.048 C.Y. CONC. PER 1.0' OF CURB FOR 6" GUTTER. *

JOINTS:

(A) WHEN INTEGRAL WITH, TIED TO, OR PLACED AGAINST PORTLAND CEMENT CONCRETE PAVEMENT (P.C.C.P.): MATCH TRANSVERSE CONTRACTION AND/OR EXPANSION JOINTS IN THE ADJACENT P.C.C.P. SLAB. IF REQUIRED, EXTEND ½" MIN. WIDTH PREFORMED EXPANSION JOINTS COMPLETELY THROUGH CURB AND GUTTER THE SAME WIDTH AS THE P.C.C.P. SLAB JOINT. FILL CURB AND GUTTER EXPANSION JOINTS WITH PREFORMED EXPANSION JOINT FILLER.

(B) ALL OTHER CASES:
SPACE CONTRACTION JOINTS IN CURB AND GUTTER AT 10 FT. INTERVALS EXCEPT AS SPECIFIED IN (A) ABOVE.

(C) CONTRACTION JOINTS:
CONTRACTION JOINTS ARE ⅛" MIN. AND ⅜" MAX. IN WIDTH. FORM JOINTS BY SAWING OR SCORING TO A MINIMUM DEPTH OF 1". FORM SCORED JOINTS BY A TOOL WHICH WILL LEAVE ROUNDED CORNERS AND DESTROY AGGREGATE INTERLOCK TO A MINIMUM DEPTH OF 1".

(D) OTHER JOINTS:
SEPARATE THE CURB AND GUTTER FROM ADJACENT SIDEWALK AT POINTS SHOWN ON DTL. DWG. NO. 608-05 BY ½" MIN. WIDTH OF PREFORMED EXPANSION JOINT MATERIAL. PLACE PREFORMED EXPANSION JOINT MATERIAL AT ALL CURB RETURNS, BRIDGES, DROP INLETS, AND WHERE MEETING CURB AND GUTTER IN PLACE.

(E) USE PREFORMED EXPANSION JOINT FILLER MEETING THE REQUIREMENTS OF STD. SPEC. 707.

RADII:

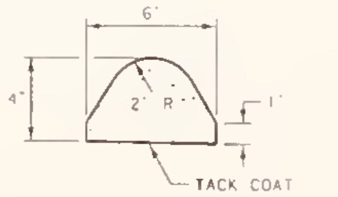
MINIMUM CURB RETURN RADII = 10'. 15' RADII ARE DESIRABLE FOR STREETS.

CONCRETE:

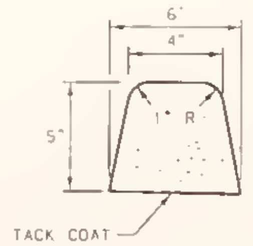
UNLESS OTHERWISE SPECIFIED, CONSTRUCT CONCRETE CURBS AND CONCRETE INTEGRAL CURB AND GUTTER WITH CLASS "D" CONCRETE OR APPROVED EQUAL.

* QUANTITIES FOR ESTIMATING PURPOSES ONLY.

BITUMINOUS CURBS



CURB SECTION
1 CUBIC FOOT OF MATERIAL WILL MAKE ABOUT 8 LINEAR FEET OF CURB. *



CURB SECTION
1 CUBIC FOOT OF MATERIAL WILL MAKE ABOUT 5 LINEAR FEET OF CURB. *

NOTES:

WHEN CURB IS USED IN CONJUNCTION WITH GUARDRAIL, USE THE 4" TYPE. OTHERWISE, THE CONTRACTOR MAY USE EITHER SECTION.

CONFORM ALL MATERIALS AND CONSTRUCTION TO THE STANDARD SPECIFICATIONS FOR BITUMINOUS CURB.

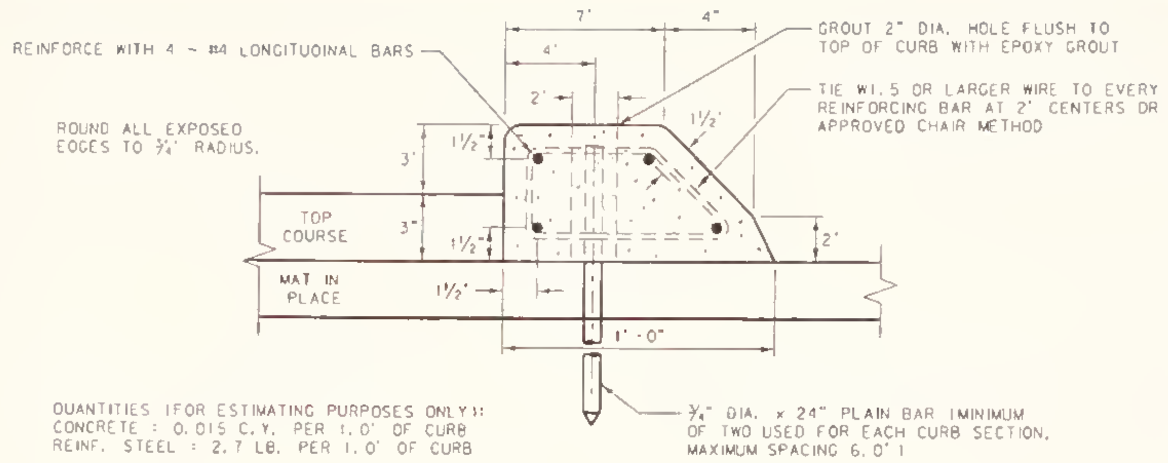
GRAVEL BASE IS INCLUDED IN THE SURFACING SECTION.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 609
DWG. NO.
609-05

MISCELLANEOUS CURBS

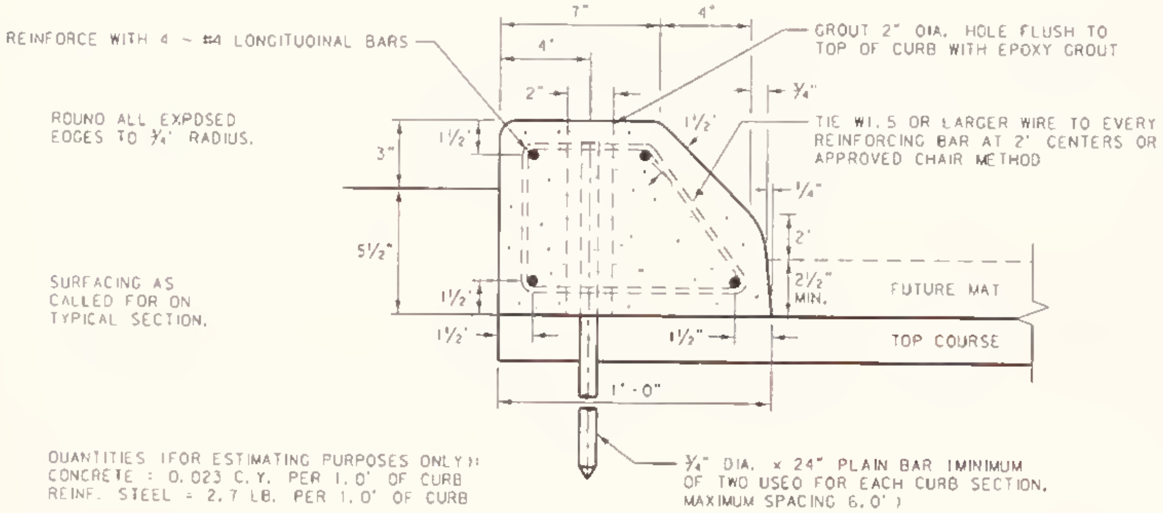
EFFECTIVE: AUGUST 1999

MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD


REINFORCE WITH 4 ~ #4 LONGITUDINAL BARS
ROUND ALL EXPOSED EDGES TO ¾" RADIUS.
7"
4"
4"
2"
1½"
3"
3"
1½"
1½"
2"
TOP COURSE
MAT IN PLACE
1'-0"
GROUT 2" DIA. HOLE FLUSH TO TOP OF CURB WITH EPOXY GROUT
TIE W1.5 OR LARGER WIRE TO EVERY REINFORCING BAR AT 2' CENTERS OR APPROVED CHAIR METHOD
¾" DIA. × 24" PLAIN BAR (MINIMUM OF TWO USED FOR EACH CURB SECTION. MAXIMUM SPACING 6.0')

QUANTITIES (FOR ESTIMATING PURPOSES ONLY):
CONCRETE : 0.015 C.Y. PER 1.0' OF CURB
REINF. STEEL : 2.7 LB. PER 1.0' OF CURB

TYPE "A" - MAT IN PLACE


REINFORCE WITH 4 ~ #4 LONGITUDINAL BARS
ROUND ALL EXPOSED EDGES TO ¾" RADIUS.
SURFACING AS CALLED FOR ON TYPICAL SECTION.
7"
4"
4"
2"
¾"
1½"
3"
5½"
1½"
1½"
¼"
2"
2½" MIN.
1½"
FUTURE MAT
TOP COURSE
1'-0"
GROUT 2" DIA. HOLE FLUSH TO TOP OF CURB WITH EPOXY GROUT
TIE W1.5 OR LARGER WIRE TO EVERY REINFORCING BAR AT 2' CENTERS OR APPROVED CHAIR METHOD
¾" DIA. × 24" PLAIN BAR (MINIMUM OF TWO USED FOR EACH CURB SECTION. MAXIMUM SPACING 6.0')

QUANTITIES (FOR ESTIMATING PURPOSES ONLY):
CONCRETE : 0.023 C.Y. PER 1.0' OF CURB
REINF. STEEL : 2.7 LB. PER 1.0' OF CURB

TYPE "B" - FUTURE MAT

CONSTRUCTION:

CURBS MAY BE CONSTRUCTED USING ANY OF THE FOLLOWING THREE METHODS:
(1) PRECAST
(2) CAST IN PLACE
(3) CONSTRUCTED BY THE USE OF AN APPROVED CURB FORMING OR SLIP FORM MACHINE.

WHEN USING EITHER METHOD (2) OR (3), REINFORCING STEEL IS NOT REQUIRED, WITH THE EXCEPTION OF THE PINS, AND THE CURBS ARE SCORED OR SAWN TO A DEPTH OF ONE-HALF INCH TO FORM CONTRACTION JOINTS AT INTERVALS OF TEN FEET OR LESS.

FORM PRECAST CURBS IN THEIR INVERTED POSITION, IN LENGTHS NOT LESS THAN FOUR FEET, OR MORE THAN TEN FEET.

MATERIAL:

CONSTRUCT CURBS OF CLASS 'D' CONCRETE, OR AN APPROVED EQUIVALENT MIX.

EPOXY BINDER FOR GROUTING MUST MEET THE REQUIREMENTS OF AASHTO M 235 (ASTM C 881).

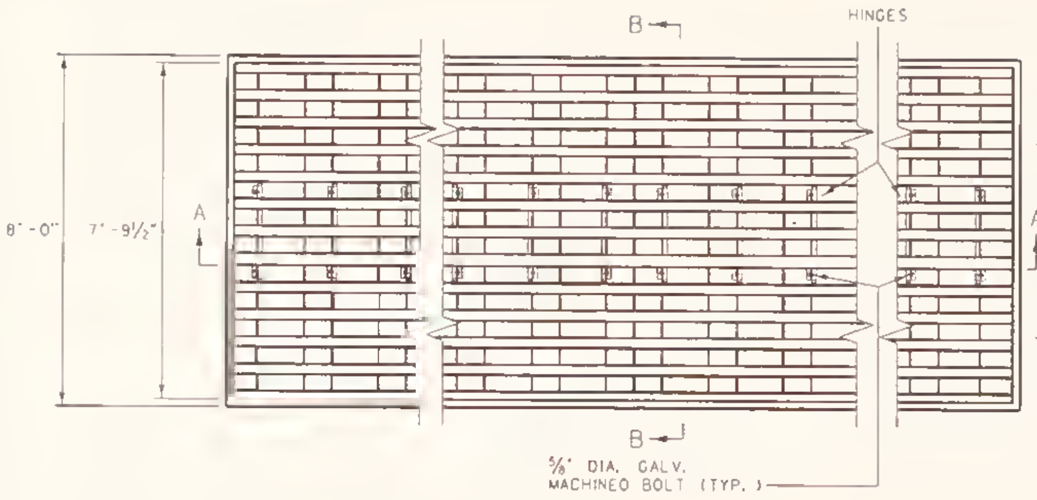
DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 609
DWG. NO.
609-10

MEDIAN CONCRETE CURBS

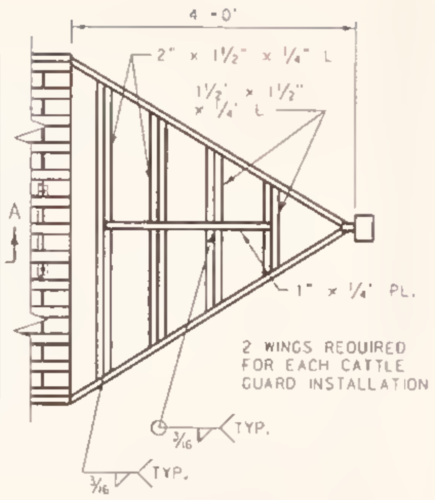
EFFECTIVE: AUGUST 1999

MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

LIVE LOADING: STANDARD (HS20) LOADING

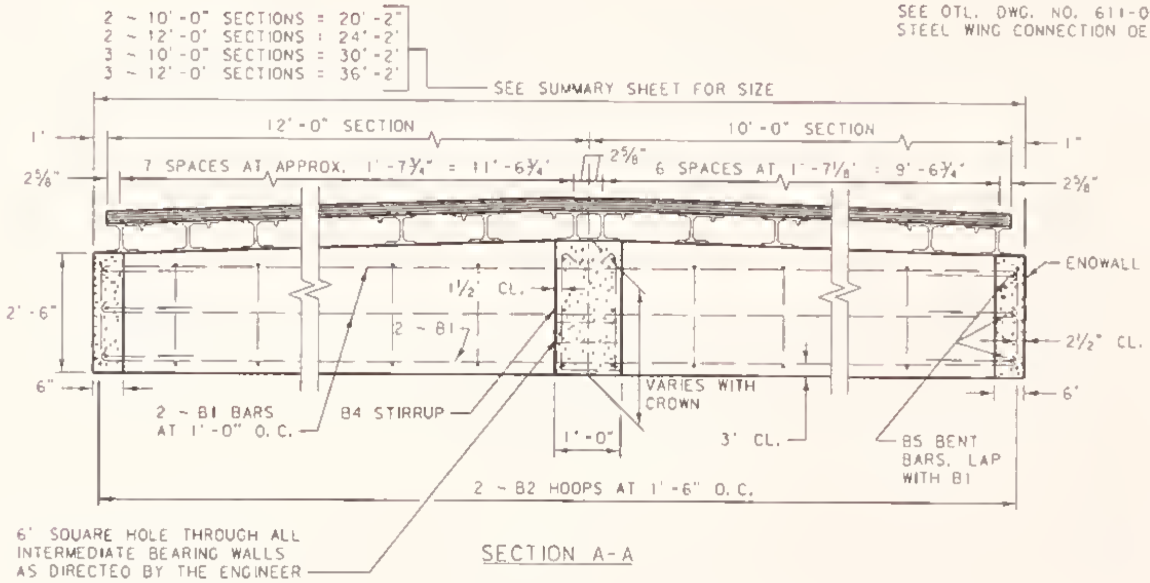


PLAN

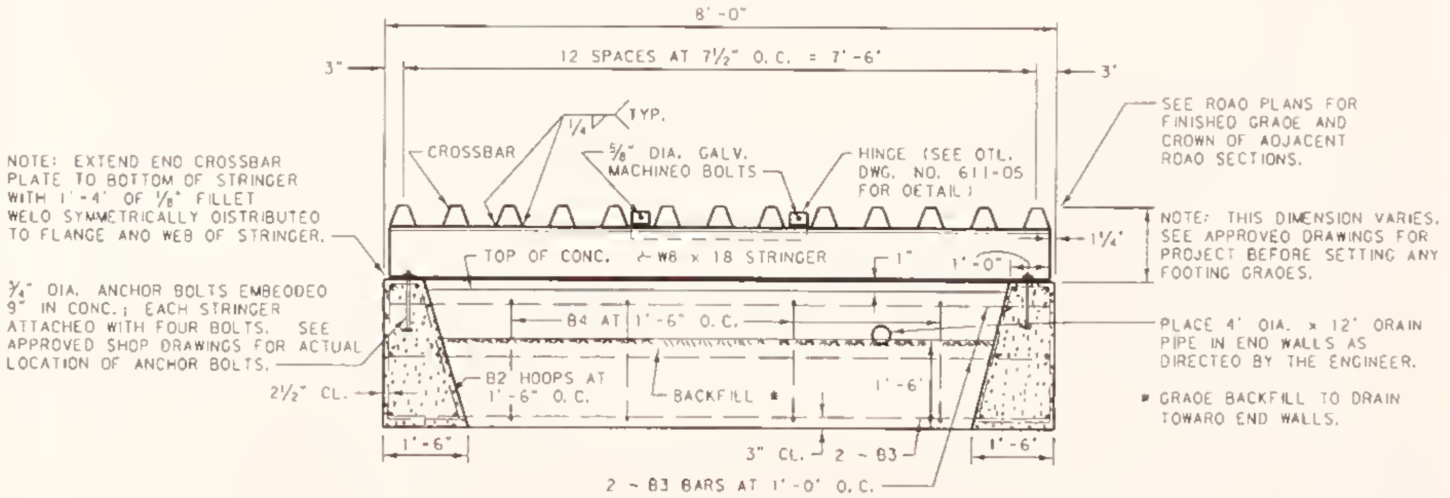


STEEL WING

SEE DTL. DWG. NO. 611-05 FOR STEEL WING CONNECTION DETAIL.


2 ~ 10'-0" SECTIONS = 20'-2"
2 ~ 12'-0" SECTIONS = 24'-2"
3 ~ 10'-0" SECTIONS = 30'-2"
3 ~ 12'-0" SECTIONS = 36'-2"
SEE SUMMARY SHEET FOR SIZE
1"
12'-0" SECTION
10'-0" SECTION
1"
2⅝"
7 SPACES AT APPROX. 1'-7¾" = 11'-6¾"
2⅝"
6 SPACES AT 1'-7⅞" = 9'-6¾"
2⅝"
ENDWALL
2'-6"
1½" CL.
2 ~ B1
2½" CL.
6"
6"
2 ~ B1 BARS AT 1'-0" O.C.
B4 STIRRUP
VARIES WITH CROWN
1'-0"
3" CL.
B5 BENT BARS, LAP WITH B1
2 ~ B2 HOOPS AT 1'-6" O.C.
6" SQUARE HOLE THROUGH ALL INTERMEDIATE BEARING WALLS AS DIRECTED BY THE ENGINEER

SECTION A-A


8'-0"
3"
12 SPACES AT 7½" O.C. = 7'-6"
3"
¼ TYP.
CROSSBAR
⅝" DIA. GALV. MACHINED BOLTS
HINGE (SEE DTL. DWG. NO. 611-05 FOR DETAIL)
SEE ROAD PLANS FOR FINISHED GRADE AND CROWN OF ADJACENT ROAD SECTIONS.
NOTE: EXTEND END CROSSBAR PLATE TO BOTTOM OF STRINGER WITH 1'-4" OF ⅛" FILLET WELD SYMMETRICALLY DISTRIBUTED TO FLANGE AND WEB OF STRINGER.
TOP OF CONC.
W8 × 18 STRINGER
1"
1'-0"
1¼"
NOTE: THIS DIMENSION VARIES. SEE APPROVED DRAWINGS FOR PROJECT BEFORE SETTING ANY FOOTING GRADES.
¾" DIA. ANCHOR BOLTS EMBEDDED 9" IN CONC.; EACH STRINGER ATTACHED WITH FOUR BOLTS. SEE APPROVED SHOP DRAWINGS FOR ACTUAL LOCATION OF ANCHOR BOLTS.
B4 AT 1'-6" O.C.
PLACE 4" DIA. × 12" DRAIN PIPE IN END WALLS AS DIRECTED BY THE ENGINEER.
B2 HOOPS AT 1'-6" O.C.
2½" CL.
BACKFILL *
1'-6"
* GRADE BACKFILL TO DRAIN TOWARD END WALLS.
1'-6"
3" CL.
2 ~ B3
1'-6"
2 ~ B3 BARS AT 1'-0" O.C.

MAX. FOOTING PRESS = 1.1 TONS/SQ. FT.

SECTION B-B

NOTE:
SEE DTL. DWG. NO. 611-05 FOR CAST-IN-PLACE CATTLE GUARD DETAILS AND BILL OF REINFORCING STEEL.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 611
DWG. NO.
611-00

CAST-IN-PLACE CATTLE GUARD

EFFECTIVE: AUGUST 1999

MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

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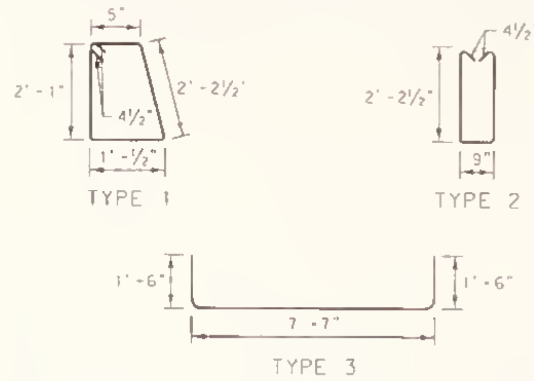
BILL OF REINFORCING STEEL

BENT BARS (ALL DIMENSIONS ARE OUT TO OUT)



20 FT. CATTLE GUARD

MARK	SIZE	NO.	TYPE	LENGTH
B1	#4	12	STR.	19'-10"
B2	#4	28	1	6'-6"
B3	#4	6	STR.	7'-7"
B4	#4	4	2	5'-11"
B5	#4	6	3	10'-7"
ESTIMATED WT. = 369 LB.				

30 FT. CATTLE GUARD

MARK	SIZE	NO.	TYPE	LENGTH
B1	#4	12	STR.	29'-10"
B2	#4	42	1	6'-6"
B3	#4	12	STR.	7'-7"
B4	#4	8	2	5'-11"
B5	#4	6	3	10'-7"
ESTIMATED WT. = 556 LB.				

24 FT. CATTLE GUARD

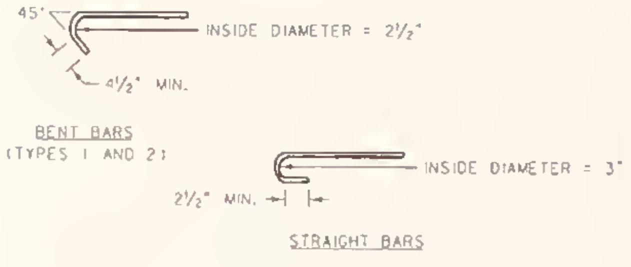
B1	#4	12	STR.	23'-10"
B2	#4	34	1	6'-6"
B3	#4	6	STR.	7'-7"
B4	#4	4	2	5'-11"
B5	#4	6	3	10'-7"
ESTIMATED WT. = 427 LB.				

36 FT. CATTLE GUARD

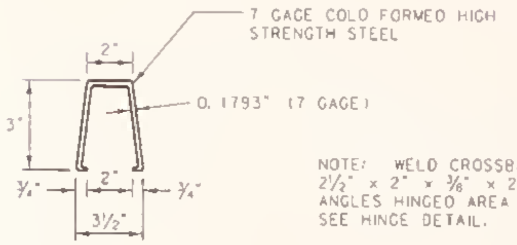
B1	#4	12	STR.	35'-10"
B2	#4	50	1	6'-6"
B3	#4	12	STR.	7'-7"
B4	#4	8	2	5'-11"
B5	#4	6	3	10'-7"
ESTIMATED WT. = 650 LB.				

ESTIMATED CLASS "A" CONC. QUANTITIES

20' CATTLE GUARD = 6 C.Y.
24' CATTLE GUARD = 7 C.Y.
30' CATTLE GUARD = 9 C.Y.
36' CATTLE GUARD = 11 C.Y.

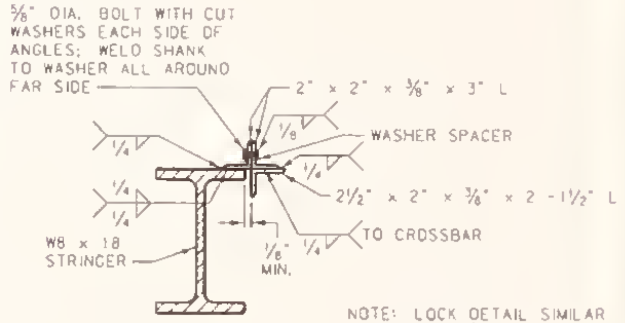


REBAR DETAILS



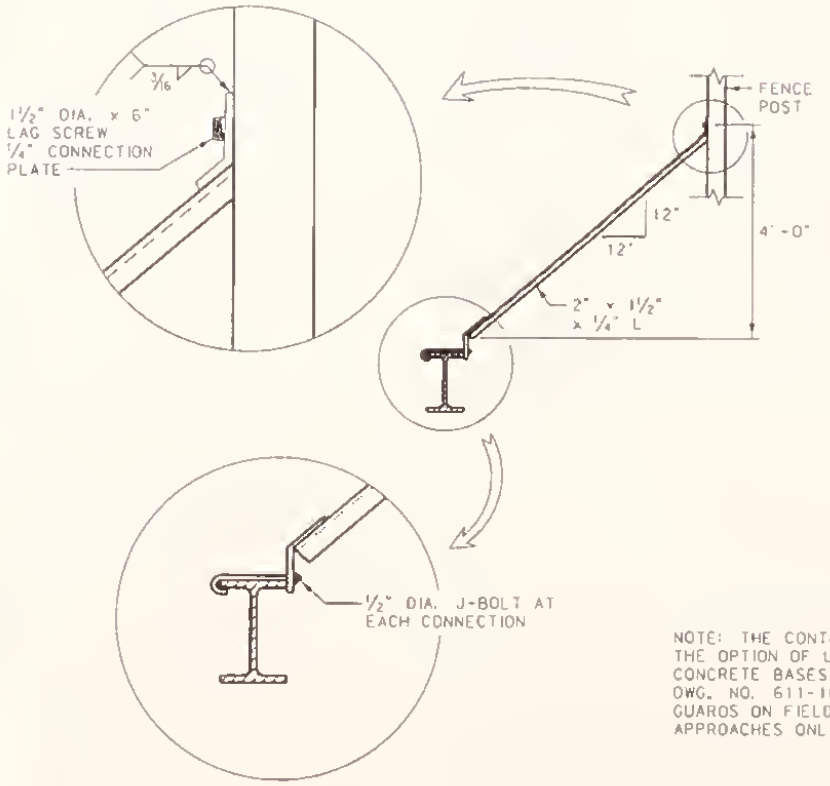
NOTE: WELD CROSSBARS TO 2½" × 2" × ⅜" × 2'-1½" ANGLES HINGED AREA ONLY. SEE HINGE DETAIL.

CROSSBAR

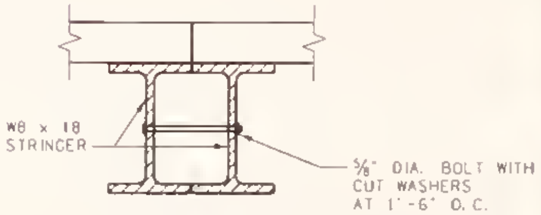


HINGE DETAIL
(HINGED AREA OPENS FOR CLEANOUT)

NOTE: LOCK DETAIL SIMILAR EXCEPT USE ⅝" DIA. GALV. MACHINED BOLT WITH GALV. CUT WASHER & GALV. HEX NUTS INSTEAD OF WELDED STUD BOLT.



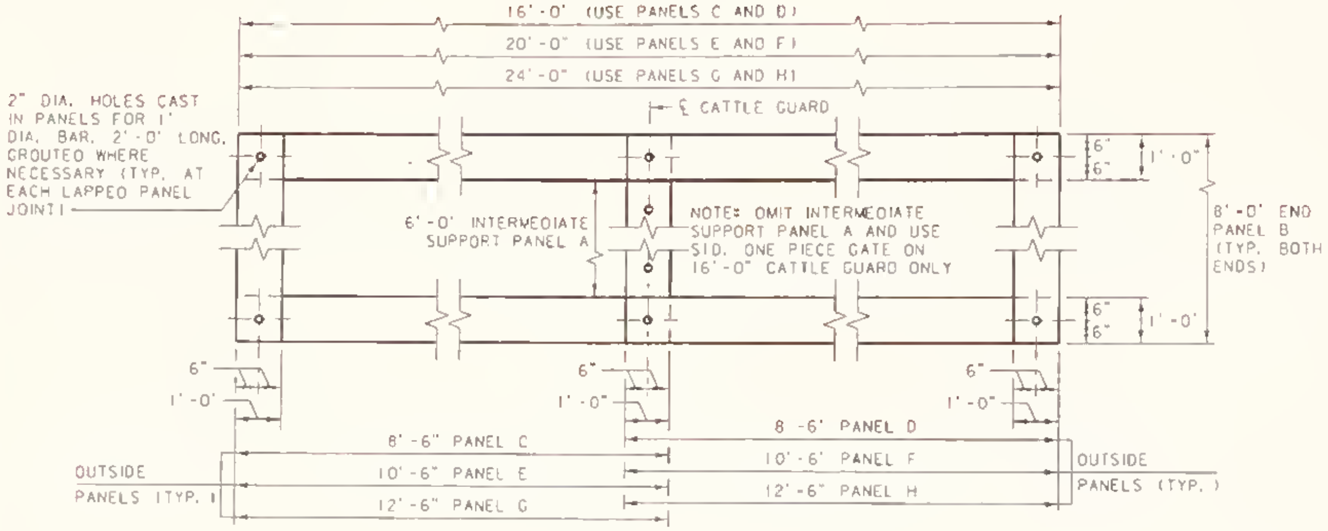
STEEL WING CONNECTION DETAILS



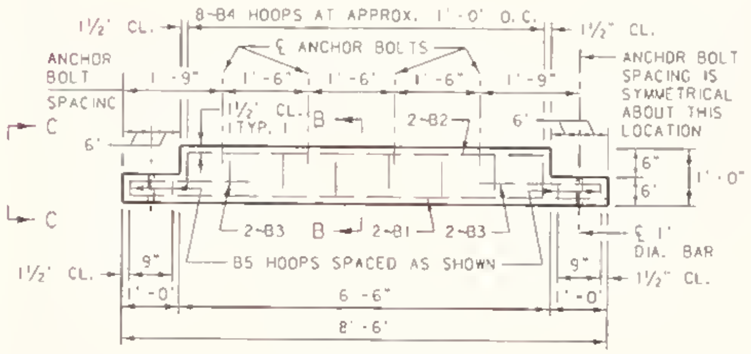
MULTIPLE INSTALLATION JOINT

NOTE: THE CONTRACTOR HAS THE OPTION OF USING PRECAST CONCRETE BASES (SEE DTL. DWG. NO. 611-101 FOR CATTLE GUARDS ON FIELD OR PRIVATE APPROACHES ONLY.

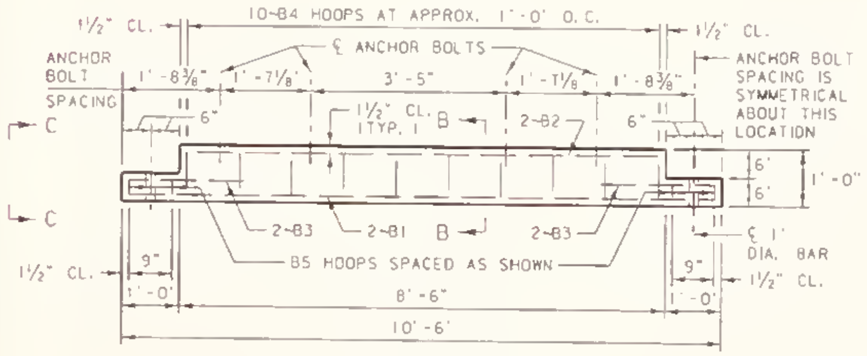
DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 611	DWG. NO. 611-05
CAST-IN-PLACE CATTLE GUARD DETAILS	
EFFECTIVE: AUGUST 1999	
MONTANA DEPARTMENT OF TRANSPORTATION	MONTANA CADD


16'-0" (USE PANELS C AND D)
20'-0" (USE PANELS E AND F)
24'-0" (USE PANELS G AND H)
℄ CATTLE GUARD
2" DIA. HOLES CAST IN PANELS FOR 1" DIA. BAR, 2'-0" LONG, GROUTED WHERE NECESSARY (TYP. AT EACH LAPPED PANEL JOINT)
6'-0" INTERMEDIATE SUPPORT PANEL A
NOTE: OMIT INTERMEDIATE SUPPORT PANEL A AND USE STD. ONE PIECE GATE ON 16'-0" CATTLE GUARD ONLY
8'-0" END PANEL B (TYP. BOTH ENDS)
OUTSIDE PANELS (TYP.)
8'-6" PANEL C
10'-6" PANEL E
12'-6" PANEL G
8'-6" PANEL D
10'-6" PANEL F
12'-6" PANEL H

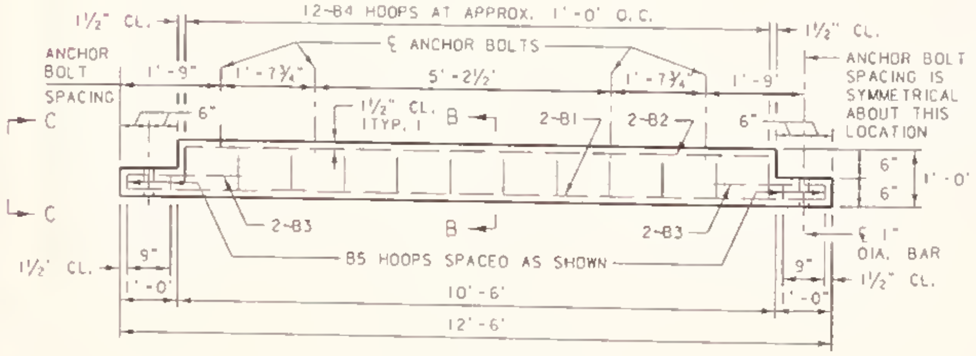
TYPICAL PLAN VIEW



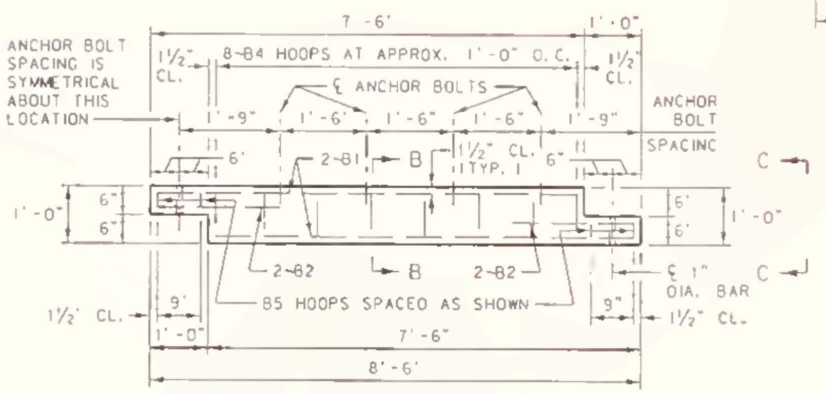
PANEL C ELEVATION



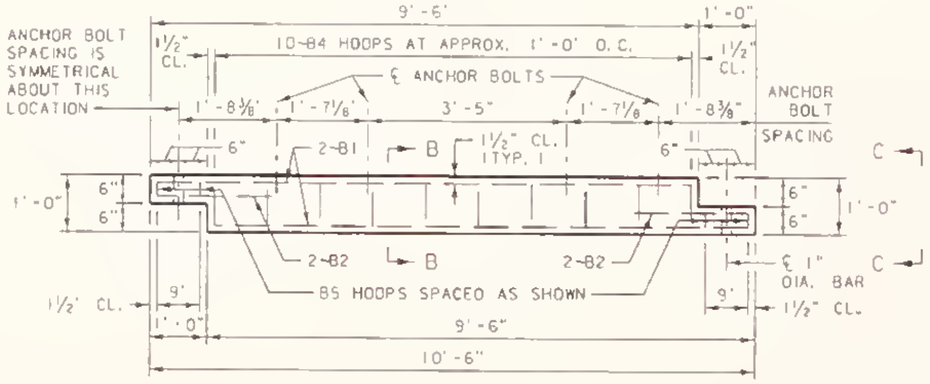
PANEL E ELEVATION



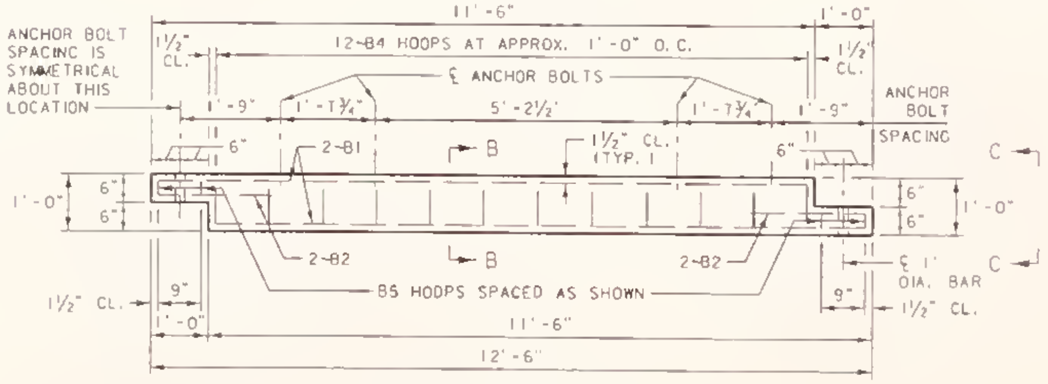
PANEL G ELEVATION



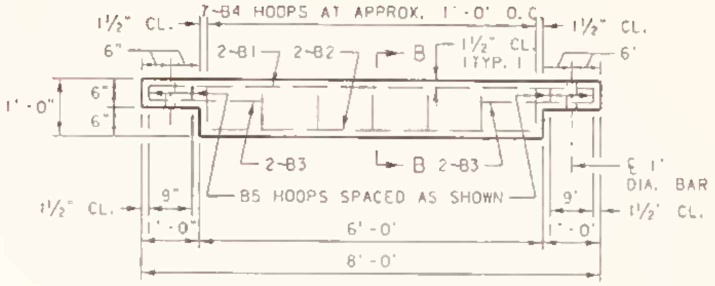
PANEL D ELEVATION



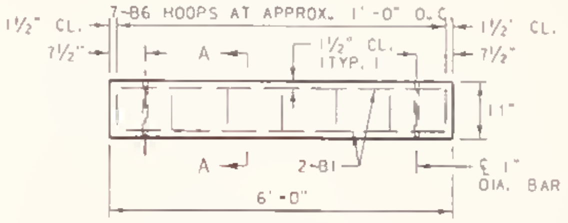
PANEL F ELEVATION



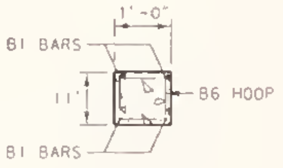
PANEL H ELEVATION



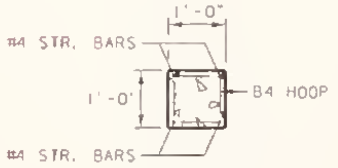
END PANEL B ELEVATION



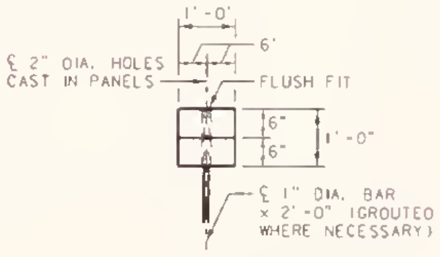
INTERMEDIATE SUPPORT PANEL A ELEVATION



SECTION A-A



SECTION B-B

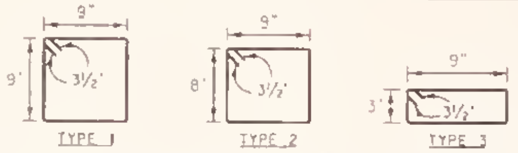

℄ 2" DIA. HOLES CAST IN PANELS
FLUSH FIT
℄ 1" DIA. BAR × 2'-0" (GROUTED WHERE NECESSARY)
1'-0"
6"

VIEW C-C

(TYP. LAPPED PANEL JOINT)

NOTE:
FOR DETAILS OF STEEL GRATES AND STEEL WINGS SEE DTL. DWG. NO. 611-00 AND 611-05.

BILL OF REINFORCING STEEL *



STRAIGHT BARS & BENT BARS (ALL DIMENSIONS OUT TO OUT)

MARK	SIZE	NO.	TYPE	LENGTH
6'-0" SECTION - PANEL A				
B1	#4	4	STRAIGHT	5'-9"
B6	#3	7	2	3'-5"
ESTIMATED WT. = 24 LB.				
8'-0" SECTION - PANEL B				
B1	#4	2	STRAIGHT	7'-9"
B2	#4	2	STRAIGHT	5'-9"
B3	#4	4	STRAIGHT	2'-2"
B4	#3	7	1	3'-7"
B5	#3	4	3	2'-7"
ESTIMATED WT. = 37 LB.				
8'-6" SECTION - PANEL C				
B1	#4	2	STRAIGHT	8'-3"
B2	#4	2	STRAIGHT	6'-3"
B3	#4	4	STRAIGHT	2'-2"
B4	#3	8	1	3'-7"
B5	#3	4	3	2'-7"
ESTIMATED WT. = 40 LB.				
8'-6" SECTION - PANEL D				
B1	#4	4	STRAIGHT	7'-3"
B2	#4	4	STRAIGHT	2'-2"
B4	#3	8	1	3'-7"
B5	#3	4	3	2'-7"
ESTIMATED WT. = 40 LB.				
10'-6" SECTION - PANEL E				
B1	#4	2	STRAIGHT	10'-3"
B2	#4	2	STRAIGHT	8'-3"
B3	#4	4	STRAIGHT	2'-2"
B4	#3	10	1	3'-7"
B5	#3	4	3	2'-7"
ESTIMATED WT. = 48 LB.				
10'-6" SECTION - PANEL F				
B1	#4	4	STRAIGHT	9'-3"
B2	#4	4	STRAIGHT	2'-2"
B4	#3	10	1	3'-7"
B5	#3	4	3	2'-7"
ESTIMATED WT. = 48 LB.				
12'-6" SECTION - PANEL G				
B1	#4	2	STRAIGHT	12'-3"
B2	#4	2	STRAIGHT	10'-3"
B3	#4	4	STRAIGHT	2'-2"
B4	#3	12	1	3'-7"
B5	#3	4	3	2'-7"
ESTIMATED WT. = 56 LB.				
12'-6" SECTION - PANEL H				
B1	#4	4	STRAIGHT	11'-3"
B2	#4	4	STRAIGHT	2'-2"
B4	#3	12	1	3'-7"
B5	#3	4	3	2'-7"
ESTIMATED WT. = 56 LB.				

* FOR ONE PANEL ONLY

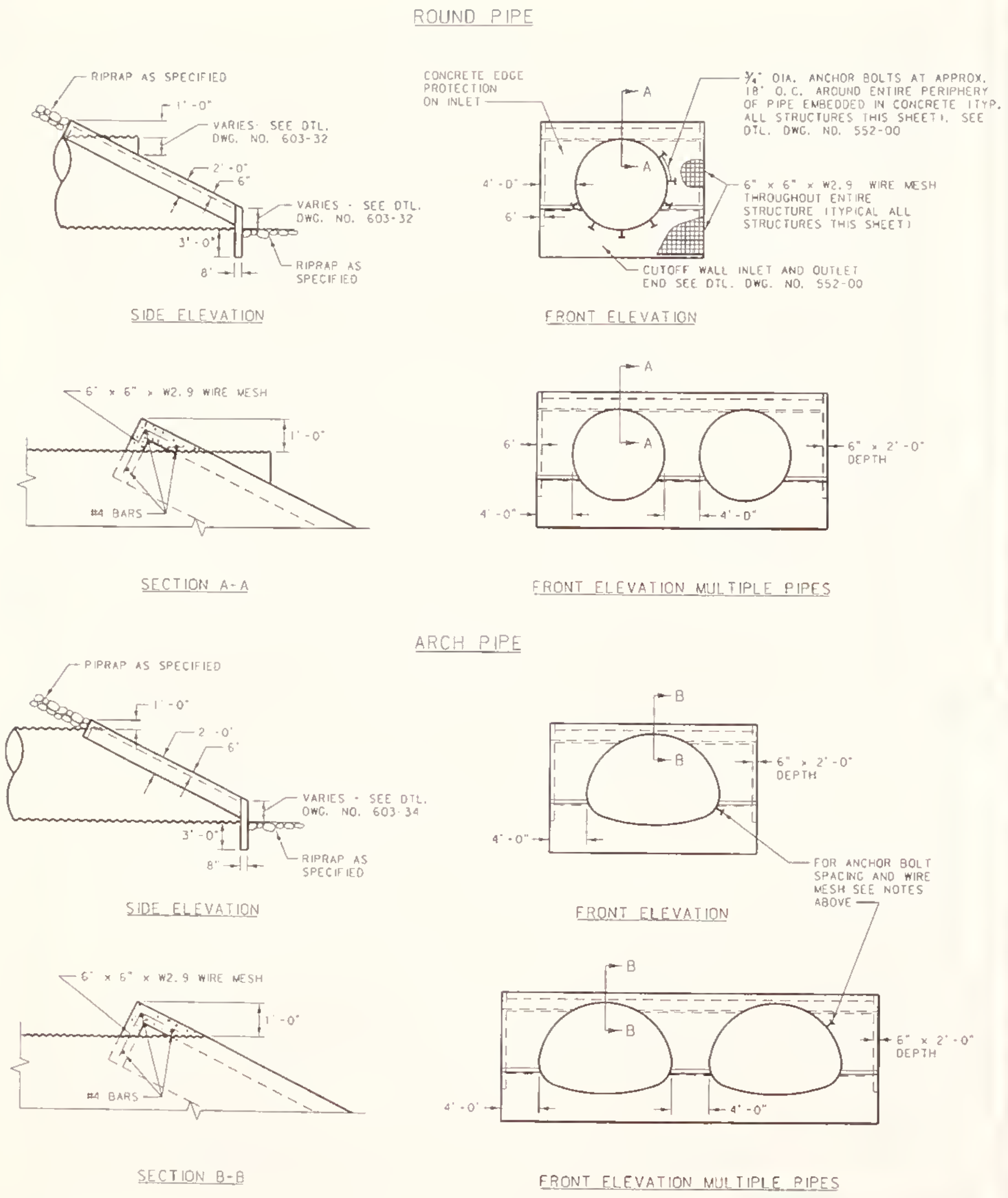
ESTIMATED CLASS "D" CONCRETE QUANTITIES
6'-0" SECTION - PANEL A = 0.20 C.Y.
8'-0" SECTION - PANEL B = 0.26 C.Y.
8'-6" SECTION - PANEL C = 0.28 C.Y.
8'-6" SECTION - PANEL D = 0.28 C.Y.
10'-6" SECTION - PANEL E = 0.35 C.Y.
10'-6" SECTION - PANEL F = 0.35 C.Y.
12'-6" SECTION - PANEL G = 0.43 C.Y.
12 -6" SECTION - PANEL H = 0.43 C.Y.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 611
DWG. NO.
611-10

PRECAST CONCRETE BASE FOR CATTLE GUARD

EFFECTIVE: AUGUST 1999

MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD


ROUND PIPE
RIPRAP AS SPECIFIED
1'-0"
VARIES: SEE DTL. DWG. NO. 603-32
2'-0"
6"
VARIES - SEE DTL. DWG. NO. 603-32
3'-0"
8"
RIPRAP AS SPECIFIED
SIDE ELEVATION
CONCRETE EDGE PROTECTION ON INLET
A
¾" DIA. ANCHOR BOLTS AT APPROX. 18" O.C. AROUND ENTIRE PERIPHERY OF PIPE EMBEDDED IN CONCRETE (TYP. ALL STRUCTURES THIS SHEET). SEE DTL. DWG. NO. 552-00
4'-0"
6"
6" x 6" x W2.9 WIRE MESH THROUGHOUT ENTIRE STRUCTURE (TYPICAL ALL STRUCTURES THIS SHEET)
CUTOFF WALL INLET AND OUTLET END SEE DTL. DWG. NO. 552-00
FRONT ELEVATION
6" x 6" x W2.9 WIRE MESH
1'-0"
#4 BARS
SECTION A-A
6" x 2'-0" DEPTH
4'-0"
FRONT ELEVATION MULTIPLE PIPES
ARCH PIPE
RIPRAP AS SPECIFIED
1'-0"
2'-0"
6"
VARIES - SEE DTL. DWG. NO. 603-34
3'-0"
8"
RIPRAP AS SPECIFIED
SIDE ELEVATION
B
6" x 2'-0" DEPTH
4'-0"
FOR ANCHOR BOLT SPACING AND WIRE MESH SEE NOTES ABOVE
FRONT ELEVATION
6" x 6" x W2.9 WIRE MESH
1'-0"
#4 BARS
SECTION B-B
6" x 2'-0" DEPTH
4'-0"
FRONT ELEVATION MULTIPLE PIPES

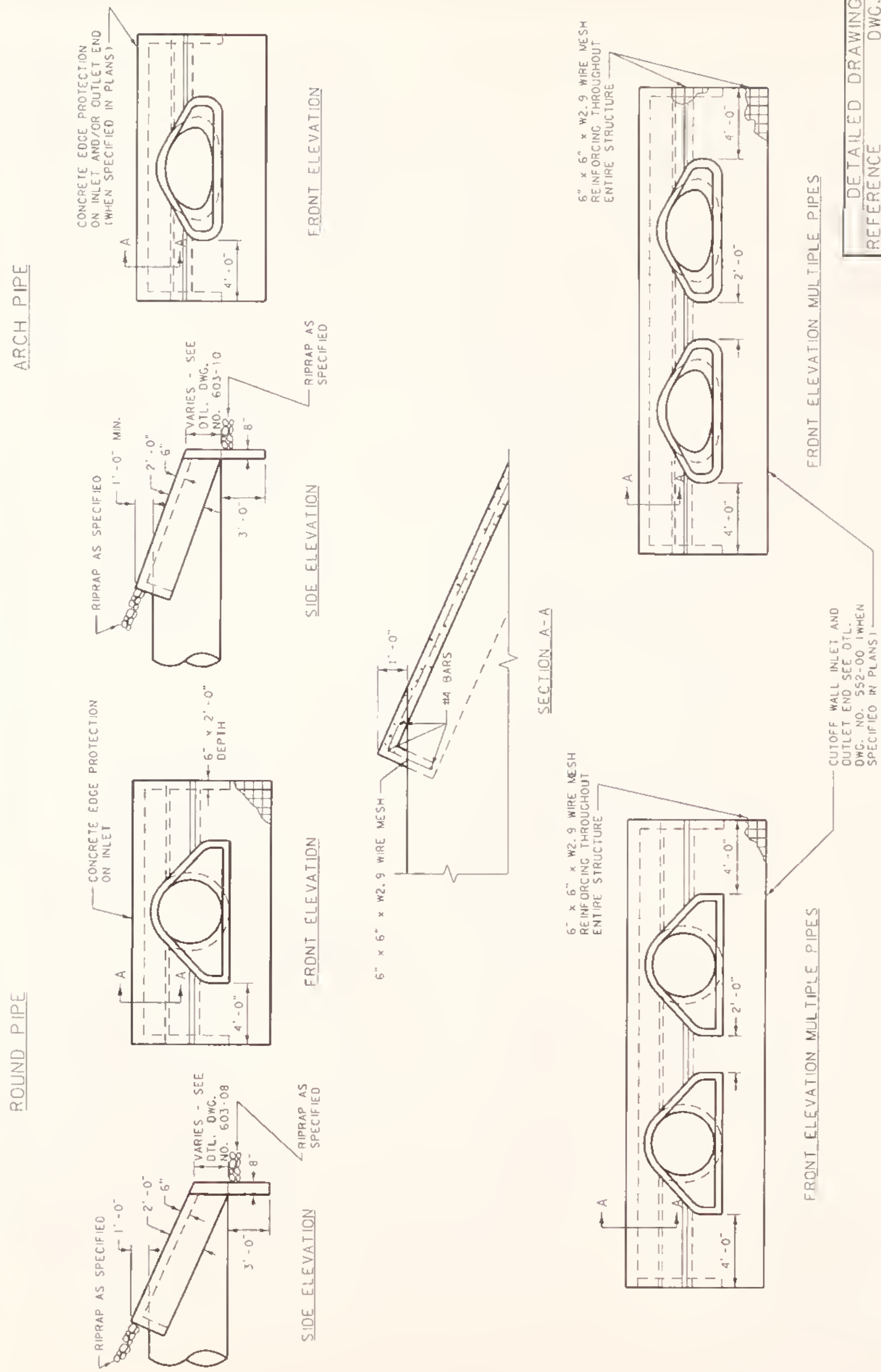
NOTES:
ALL CONCRETE IS CLASS "DD" OR EQUAL.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 613
DWG. NO.
613-06

CONCRETE EDGE PROTECTION
FOR METAL CULVERTS

EFFECTIVE: AUGUST 1999

MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD


ARCH PIPE
CONCRETE EDGE PROTECTION ON INLET AND/OR OUTLET END (WHEN SPECIFIED IN PLANS)
A
4'-0"
FRONT ELEVATION
RIPRAP AS SPECIFIED
1'-0" MIN.
2'-0"
6"
VARIES - SEE DTL. DWG. NO. 603-10
8"
3'-0"
RIPRAP AS SPECIFIED
SIDE ELEVATION
ROUND PIPE
CONCRETE EDGE PROTECTION ON INLET
6" x 2'-0" DEPTH
4'-0"
FRONT ELEVATION
RIPRAP AS SPECIFIED
1'-0"
2'-0"
6"
VARIES - SEE DTL. DWG. NO. 603-08
8"
3'-0"
RIPRAP AS SPECIFIED
SIDE ELEVATION
1'-0"
#4 BARS
6" x 6" x W2.9 WIRE MESH
SECTION A-A
6" x 6" x W2.9 WIRE MESH REINFORCING THROUGHOUT ENTIRE STRUCTURE
4'-0"
2'-0"
FRONT ELEVATION MULTIPLE PIPES
CUTOFF WALL INLET AND OUTLET END SEE DTL. DWG. NO. 552-00 (WHEN SPECIFIED IN PLANS)
6" x 6" x W2.9 WIRE MESH REINFORCING THROUGHOUT ENTIRE STRUCTURE
4'-0"
2'-0"
FRONT ELEVATION MULTIPLE PIPES

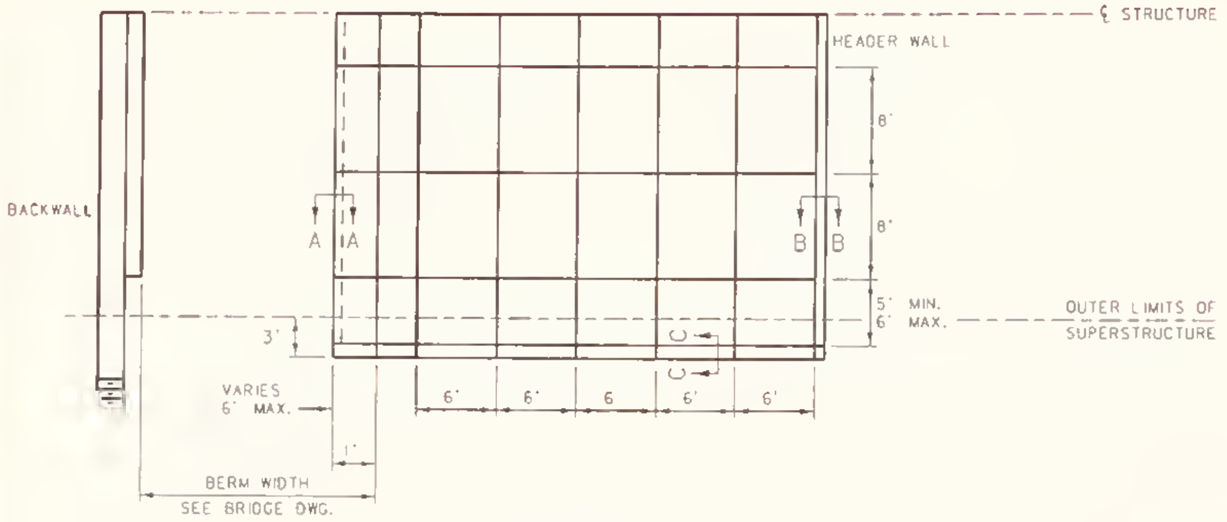
NOTES:
ALL CONCRETE IS CLASS "DD" OR EQUAL.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 603,613
DWG. NO.
613-08

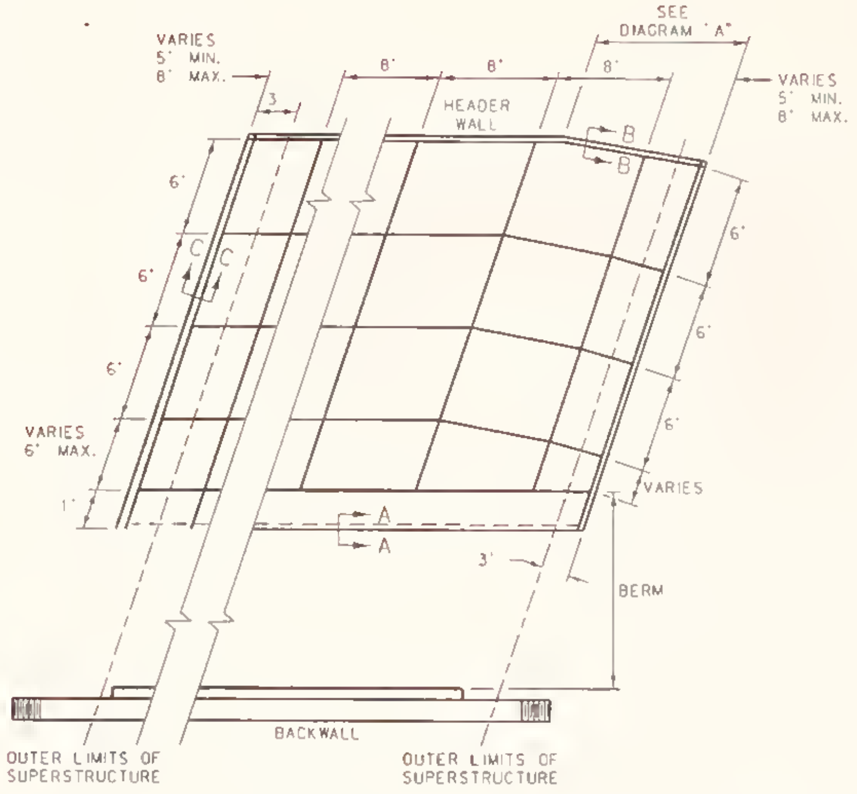
CONCRETE EDGE PROTECTION
FOR CONCRETE CULVERTS

EFFECTIVE: AUGUST 1999

MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



STRAIGHT STRUCTURE



SKEWED STRUCTURE

CAST-IN-PLACE CONCRETE:

LOCATE JOINTS AS INDICATED ON THE PLANS. IF CONSTRUCTION IS STOPPED FOR OVER TWO HOURS, CREATE A CONSTRUCTION JOINT. USE CLASS "D" CONCRETE FOR ALL CAST-IN-PLACE CONCRETE.

USE AN APPROVED ½" EXPANSION JOINT FILLER WHENEVER THE CAST-IN-PLACE CONCRETE ABUTS AGAINST ANY PART OF THE BRIDGE STRUCTURE.

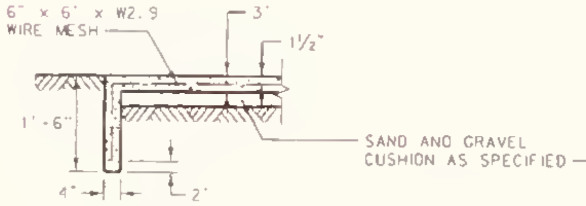
CLEAR THE EMBANKMENT SLOPE OF ALL BRUSH, DEBRIS AND RUBBLE. A CUSHION IS NOT REQUIRED FOR GRAVEL EMBANKMENT SLOPES. FINISH ALL SLOPES TO A REASONABLY UNIFORM SURFACE OR TO THE SLOPE INDICATED IN THE BRIDGE PLANS. COMPACT ALL LOOSE MATERIAL TO THE SATISFACTION OF THE ENGINEER. LEAVE THE ADJACENT SLOPE AREA IN A SMOOTH, UNIFORM CONDITION.

REINFORCING STEEL:

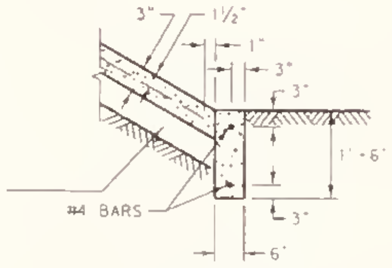
(MAY USE EITHER ALTERNATE LISTED BELOW)

1. #3 BARS AT 10" O.C. (HORIZONTAL AND VERTICAL SPACING) MIN. COVER OF 2"
2. 6" x 6" x W2.9 WIRE MESH

12" OVERLAP REQUIRED AT CONSTRUCTION JOINTS FOR REINFORCING STEEL AND WIRE MESH.

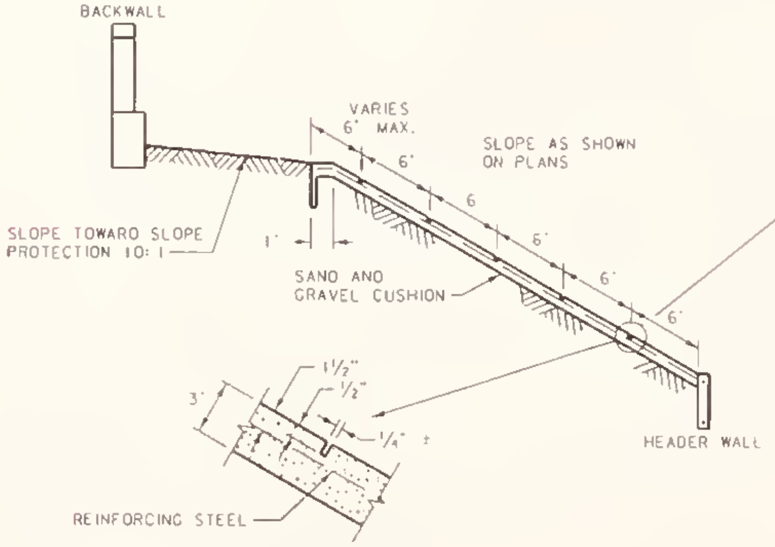


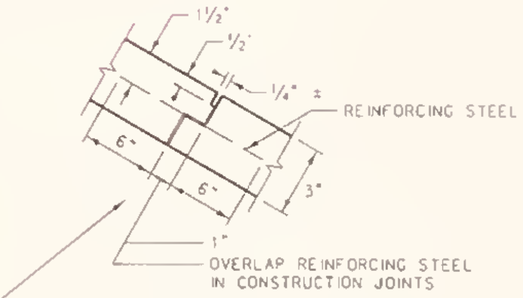
SECTION A-A



SECTION B-B

HEADER WALL



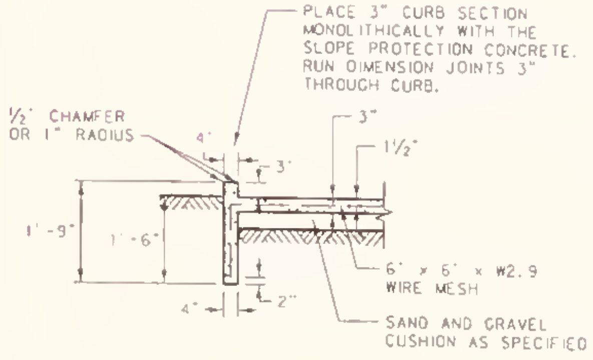


VERTICAL AND HORIZONTAL
CONSTRUCTION JOINT

USE AS NEEDED IN PLACING SLAB. WHEN REQUIRED, USE IN LIEU OF A DIMENSION JOINT AT THE SAME SPACING AS A DIMENSION JOINT.

JOINTS MAY BE SAWED, MADE WITH GROOVING TOOLS OR REMOVABLE INSERTS OF AN APPROVED TYPE.

IF JOINTS ARE TO BE SAWED, SAW JOINTS JUST AFTER CONCRETE HAS SET BUT BEFORE UNCONTROLLED CRACKING OCCURS.


PLACE 3" CURB SECTION MONOLITHICALLY WITH THE SLOPE PROTECTION CONCRETE. RUN DIMENSION JOINTS 3" THROUGH CURB.
½" CHAMFER OR 1" RADIUS
4"
3"
3"
1½"
1'-9"
1'-6"
6" x 6" x W2.9 WIRE MESH
4"
2"
SAND AND GRAVEL CUSHION AS SPECIFIED

SECTION C-C

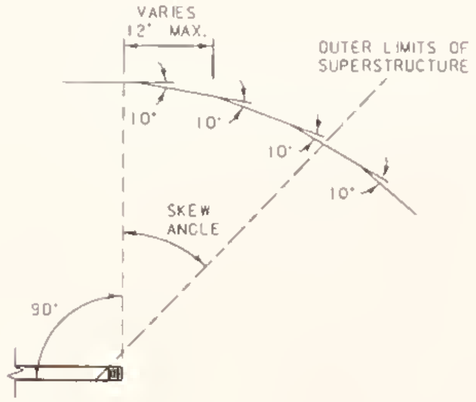


DIAGRAM "A"

VERTICAL AND HORIZONTAL
DIMENSION JOINT

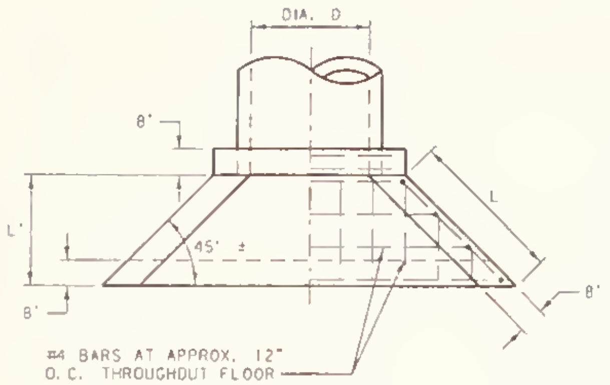
6' VERTICAL SPACING OR AS NOTED.
8' HORIZONTAL SPACING OR AS NOTED.
JOINTS MAY BE SAWED, MADE WITH GROOVING TOOLS OR REMOVABLE INSERTS OF AN APPROVED TYPE.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 613
DWG. NO.
613-10

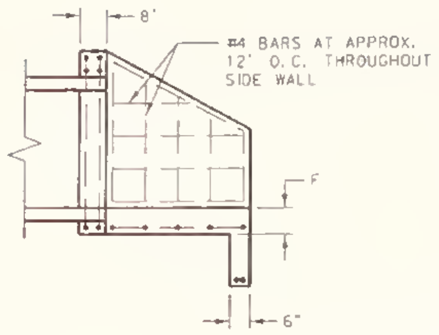
CONCRETE SLOPE
PROTECTION

EFFECTIVE: AUGUST 1999

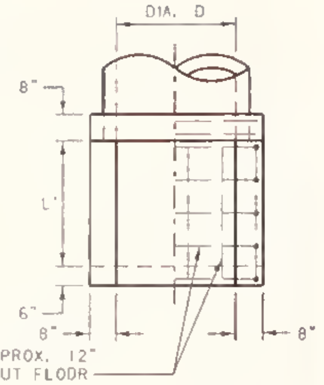
MONTANA DEPARTMENT
OF TRANSPORTATION
MONTANA CADD



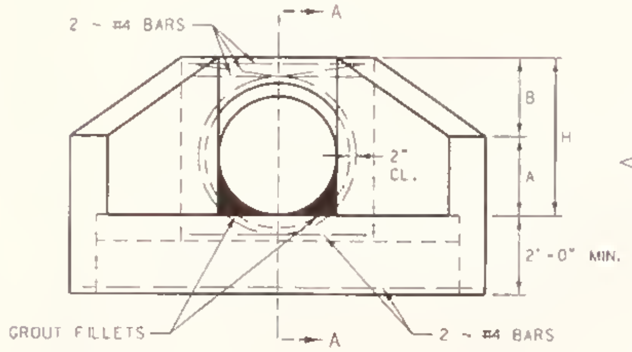
PLAN



SECTION B-B

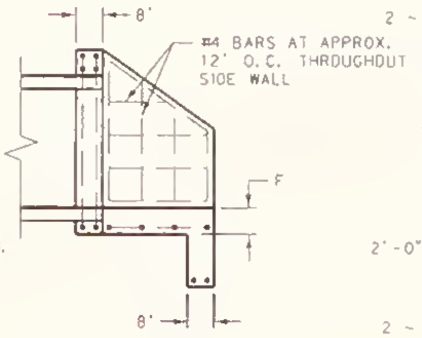


PLAN

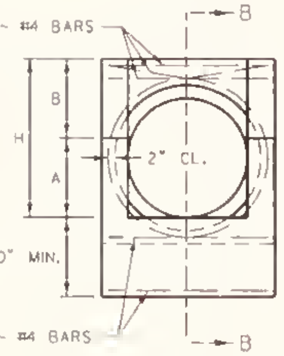


ELEVATION

INLET HEADWALL



SECTION A-A



ELEVATION

OUTLET HEADWALL

CHAMFER ALL EXPOSED CORNERS 1". REINFORCING STEEL TO BE NOT LESS THAN 1½" TO NEAREST FACE OF CONCRETE.

INLET AND OUTLET HEADWALLS FOR RCP

CULVERT		CL. "DO" CONC. OR EQUAL (C.Y.)		DIMENSION TABLE						
DIA. D	AREA (SQ. FT.)	INLET	OUTLET	A	B	H	L	L"	F	L'
18"	1.77	0.80	0.60	1'-3"	1'-3"	2'-6"	2'-6"	1'-9"	6½"	2'-2"
24"	3.14	1.00	0.86	1'-6"	1 -6"	3'-0"	3'-0"	2'-1"	7"	2 -6'
30"	4.91	1.42	1.14	1'-9"	1'-9"	3'-6"	3'-6"	2'-6"	7½"	2'-10"
36"	7.07	1.84	1.43	2'-0"	2'-0"	4'-0"	4'-0"	2'-10"	8"	3'-2'
42'	9.62	2.12	1.73	2'-3"	2'-3"	4'-6"	4'-6"	3'-2"	8½"	3'-6'
48"	12.57	2.34	2.07	2'-6"	2'-6"	5'-0"	5'-0"	3 -6'	9"	3'-10"

INLET AND OUTLET HEADWALLS FOR CMP

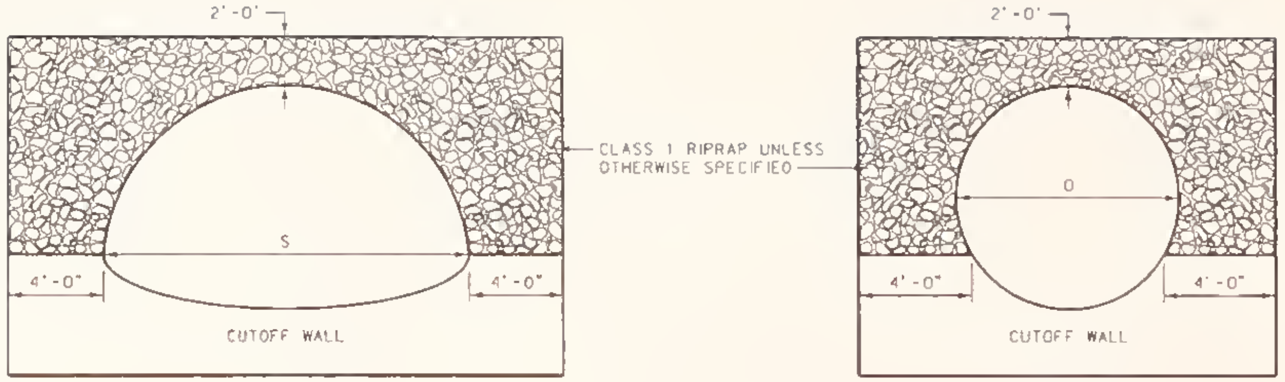
CULVERT		CL. "DO" CONC. OR EQUAL (C.Y.)		DIMENSION TABLE						
DIA. D	AREA (SQ. FT.)	INLET	OUTLET	A	B	H	L	L'	F	L'
18"	1.77	0.73	0.59	1'-3"	1'-3"	2'-6"	2'-6"	1'-9"	6"	2'-2"
24"	3.14	0.91	0.76	1'-6"	1'-6"	3'-0"	3'-0"	2'-1"	6"	2'-6'
30"	4.91	1.06	0.95	1'-9"	1'-9"	3'-6"	3'-6"	2'-6'	6"	2'-10"
36"	7.07	1.68	1.11	2'-0"	2'-0"	4'-0"	4'-0"	2'-10'	6"	3'-2'
42"	9.62	2.10	1.40	2'-3"	2'-3"	4'-6"	4'-6"	3'-2'	6"	3'-6'
48'	12.57	2.32	1.66	2'-6"	2'-6'	5'-0"	5'-0"	3'-6:	6"	3'-10"

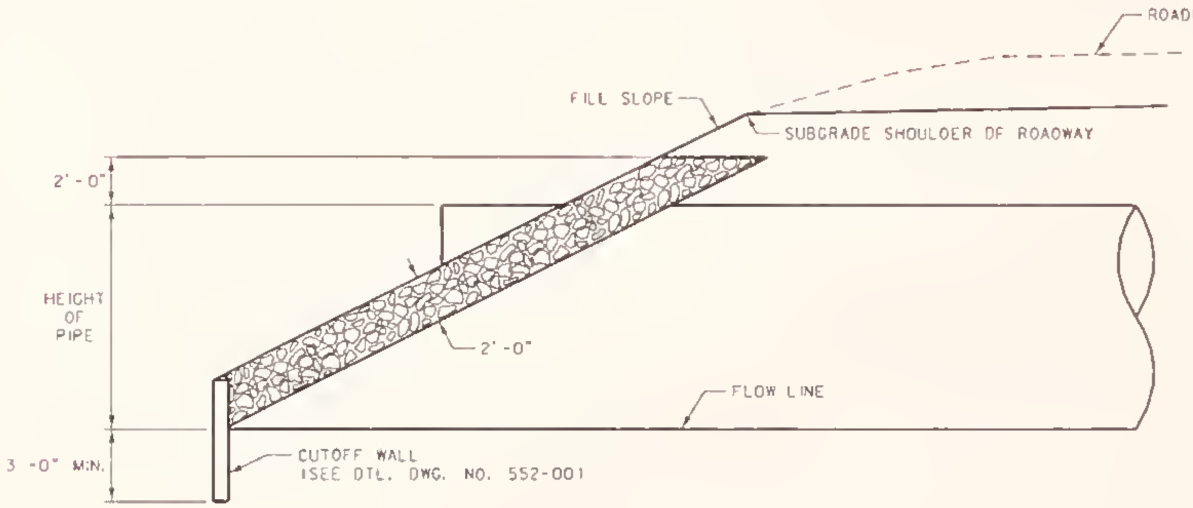
DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 613
DWG. NO.
613-12

INLET AND OUTLET
HEADWALLS FOR
RCP AND CMP PIPES

EFFECTIVE: AUGUST 1999

MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD




ROADWAY
FILL SLOPE
SUBGRADE SHOULDER OF ROADWAY
2'-0"
HEIGHT OF PIPE
2'-0"
FLOW LINE
3'-0" MIN.
CUTOFF WALL (SEE DTL. DWG. NO. 552-001

NOTES:

KEY ENDS OF RIPRAP WALLS INTO THE EMBANKMENT SLOPES A MINIMUM OF 2 FEET FROM OUTER FACE OF THE RIPRAP FOR THE FULL HEIGHT OF THE RIPRAP WALL.

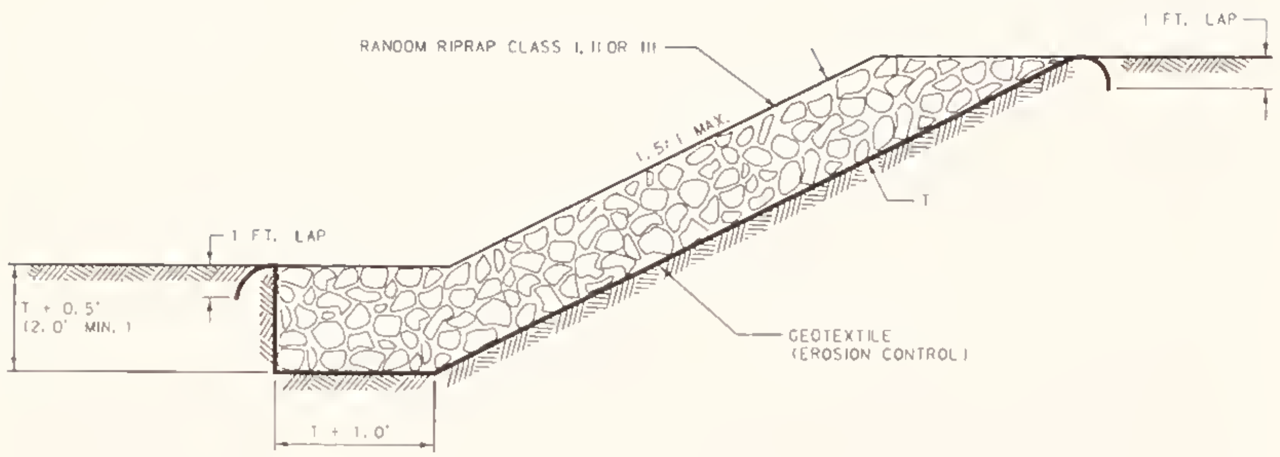
SEE SPECIFICATIONS FOR GRADATION, CLASS AND CONSTRUCTION METHODS.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 613
DWG. NO.
613-14

CULVERT RIPRAP

EFFECTIVE: AUGUST 1999

MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



EMBANKMENT PROTECTION

MINIMUM T FOR:
CLASS I RIPRAP = 1.5'
CLASS II RIPRAP = 2.5'
CLASS III RIPRAP = 3.0'

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 613, 622
DWG. NO.
613-16

EMBANKMENT PROTECTION

EFFECTIVE: AUGUST 1999
MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

CONCRETE:

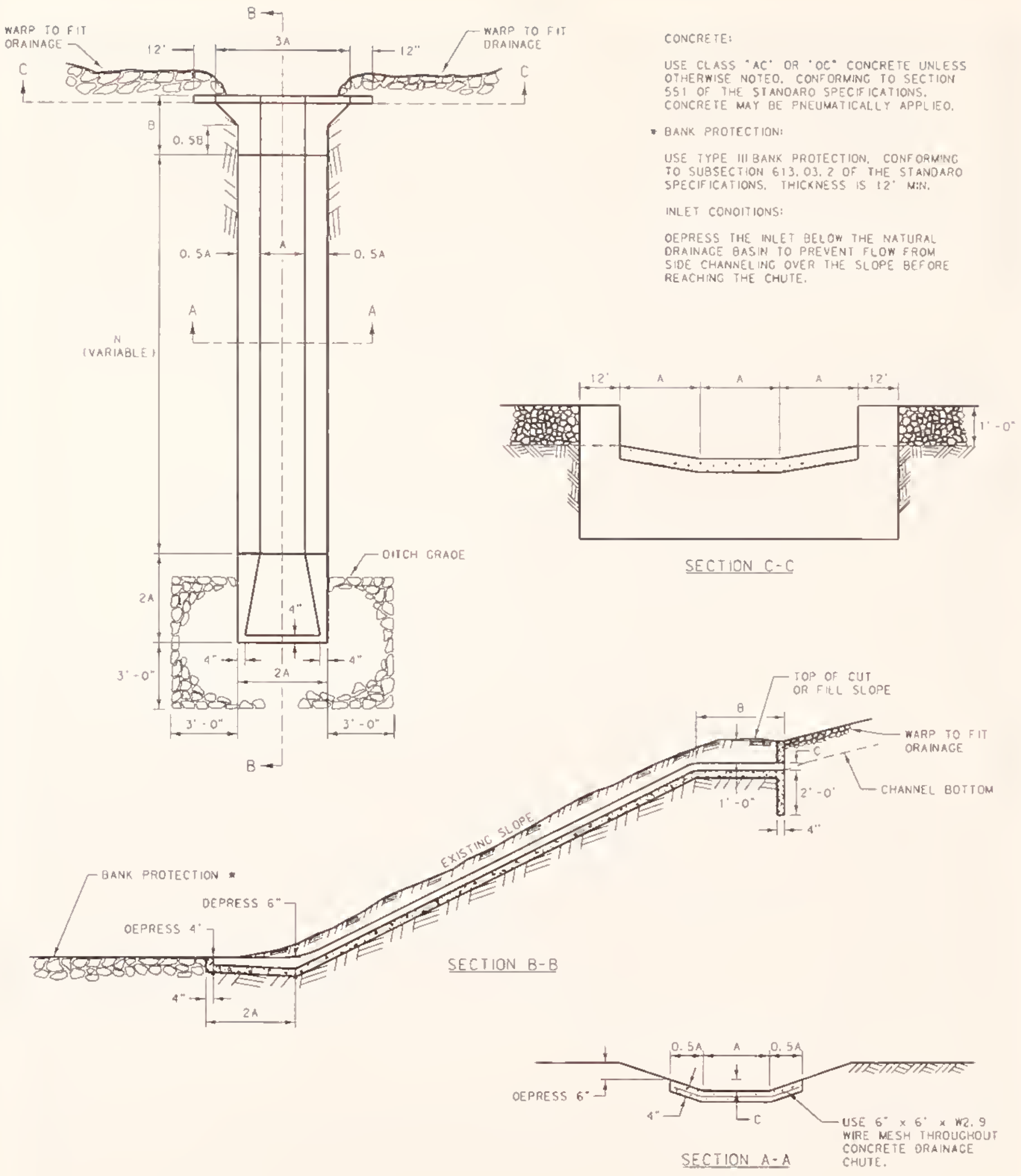
USE CLASS "AC" OR "DC" CONCRETE UNLESS OTHERWISE NOTED, CONFORMING TO SECTION 551 OF THE STANDARD SPECIFICATIONS. CONCRETE MAY BE PNEUMATICALLY APPLIED.

* BANK PROTECTION:

USE TYPE III BANK PROTECTION, CONFORMING TO SUBSECTION 613.03.2 OF THE STANDARD SPECIFICATIONS. THICKNESS IS 12" MIN.

INLET CONDITIONS:

DEPRESS THE INLET BELOW THE NATURAL DRAINAGE BASIN TO PREVENT FLOW FROM SIDE CHANNELING OVER THE SLOPE BEFORE REACHING THE CHUTE.



SECTION C-C

SECTION B-B

SECTION A-A

TYPE	DIMENSIONS			QUANTITIES
	A	B	C	CONCRETE
1	2'-0"	4'-0"	0'-4"	0.7 C.Y. + N x 0.051 C.Y./L.F.
2	2'-0"	4'-0"	1'-0"	0.9 C.Y. + N x 0.056 C.Y./L.F.
3	4'-0"	8'-0"	1'-0"	2.2 C.Y. + N x 0.105 C.Y./L.F.
4	4'-0"	8'-0"	1'-6"	2.3 C.Y. + N x 0.111 C.Y./L.F.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 551, 613
DWG. NO.
613-18

CONCRETE DRAINAGE
CHUTE

EFFECTIVE: AUGUST 1999
MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

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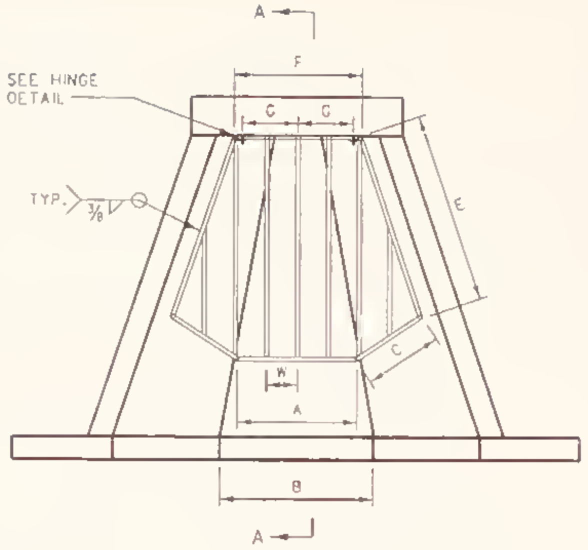
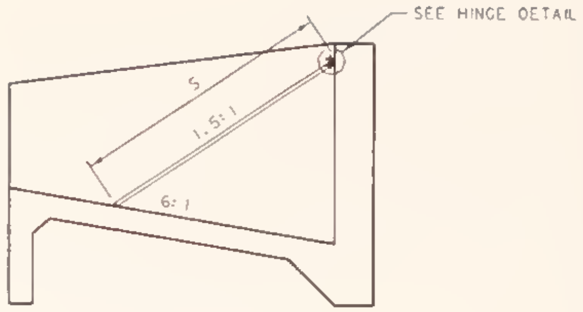


PLAN VIEW



SECTION A-A

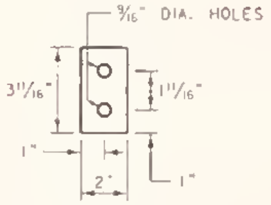
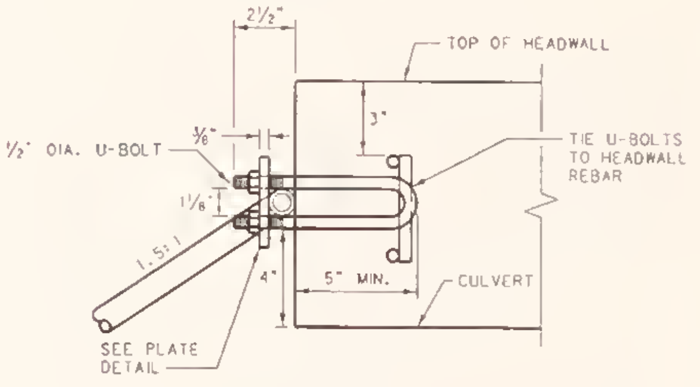


PLATE DETAIL



HINGE DETAIL

CSP									
CULVERT DIA. D	DIMENSIONS (FT.)								¾" GSP OR #5 REBAR •
	B	A	C	E	F	S	W	G	
18"	1.5	1.19	0.74	2.32	0.80	2.76	0.36	0.23	19.54'
18"	2.5	1.97	0.69	2.42	0.80	2.76	0.46	0.27	20.21'
18"	3.5	2.75	0.64	2.57	0.80	2.76	0.43	0.27	24.60'
24"	2.0	1.55	1.07	2.81	1.30	3.48	0.50	0.37	25.26'
24"	3.0	2.28	1.01	2.91	1.30	3.48	0.59	0.46	26.19'
24"	4.0	3.02	0.96	3.03	1.30	3.48	0.51	0.38	31.81'
30"	2.5	1.91	1.40	3.31	1.80	4.20	0.47	0.77	37.99'
30"	3.5	2.22	1.34	3.40	1.80	4.20	0.54	0.77	37.33'
30"	4.5	3.33	1.28	3.51	1.80	4.20	0.60	0.77	38.73'
36"	3.0	2.27	1.73	3.81	2.30	4.92	0.57	1.00	45.20'
36"	4.0	3.96	1.67	3.89	2.30	4.92	0.63	1.00	47.38'
36"	5.0	3.65	1.61	3.99	2.30	4.92	0.56	0.99	53.16'
42"	3.5	2.63	2.06	4.31	2.80	5.64	0.67	1.20	52.15'
42"	4.5	3.31	1.99	4.39	2.80	5.64	0.59	1.00	60.53'
42"	5.5	3.99	1.93	4.81	2.80	5.64	0.63	1.10	61.91'
48"	4.0	2.99	2.38	4.81	3.30	6.37	0.62	1.50	68.28'
48"	5.0	3.66	2.32	4.89	3.30	6.37	0.66	1.50	69.12'
48"	6.0	4.33	2.26	4.97	3.30	6.37	0.59	1.50	79.39'

RCP									
CULVERT DIA. D	DIMENSIONS (FT.)								¾" GSP OR #5 REBAR •
	B	A	C	E	F	S	W	G	
18"	1.5	1.27	0.80	2.58	0.80	3.06	0.39	0.26	21.38'
18"	2.5	2.14	0.74	2.70	0.80	3.06	0.50	0.27	22.03'
18"	3.5	3.00	0.69	2.87	0.80	3.06	0.46	0.27	27.05'
24"	2.0	1.62	1.14	3.13	1.30	3.84	0.53	0.40	27.50'
24"	3.0	2.46	1.08	3.24	1.30	3.84	0.47	0.34	33.81'
24"	4.0	3.27	1.02	3.38	1.30	3.84	0.55	0.42	34.65'
30"	2.5	2.03	1.48	3.68	1.80	4.62	0.50	0.77	40.94'
30"	3.5	2.81	1.41	3.79	1.80	4.62	0.57	0.77	41.30'
30"	4.5	3.59	1.36	3.91	1.80	4.62	0.52	0.77	48.45'
36"	3.0	2.41	1.82	4.24	2.30	5.41	0.60	1.00	48.83'
36"	4.0	3.16	1.75	4.34	2.30	5.41	0.54	0.95	57.02'
36"	5.0	3.92	1.69	4.44	2.30	5.41	0.60	1.00	57.31'
42"	3.5	2.79	2.16	4.79	2.80	6.19	0.57	1.00	64.85'
42"	4.5	3.53	2.09	4.88	2.80	6.19	0.62	1.10	65.70'
42"	5.5	4.27	2.03	4.99	2.80	6.19	0.67	1.20	66.59'
48"	4.0	3.17	2.49	5.35	3.30	6.97	0.65	1.50	73.74'
48"	5.0	3.90	2.43	5.44	3.30	6.97	0.58	1.50	85.36'
48"	6.0	4.63	2.36	5.53	3.30	6.97	0.63	1.50	85.17'

DIMENSIONS AND QUANTITIES ARE FOR ESTIMATING PURPOSES ONLY.

NOTES:

PAINT ALL WELDS AND OTHER NON-GALVANIZED PARTS IN ACCORDANCE WITH SECTION 710 OF THE STANDARD SPECIFICATIONS.

USE OF PIPE OR REBAR FOR TRASHGUARD TO BE DETERMINED BY THE ENGINEER.

W = CENTER TO CENTER PIPE OR REBAR SPACING.

TWO ½" DIA. U-BOLT AND PLATE ASSEMBLIES NEEDED PER TRASHGUARD.

• ¾" DIA. SCHEDULE 80 GALV. STEEL PIPE (CSP)

OR

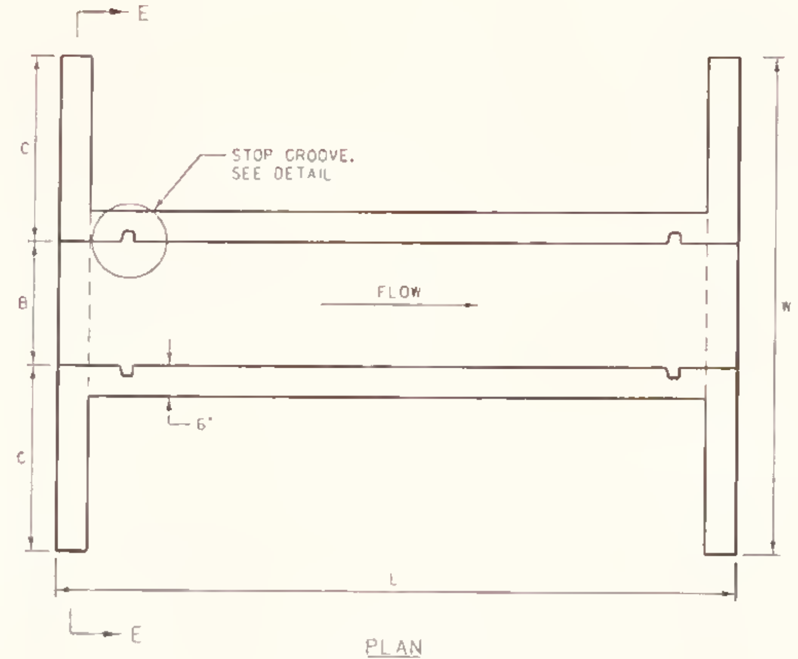
#5 (⅝" DIA.) REINFORCING BAR (REBAR = 1.043 LB./L.F.)

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 615
DWG. NO.
615-02

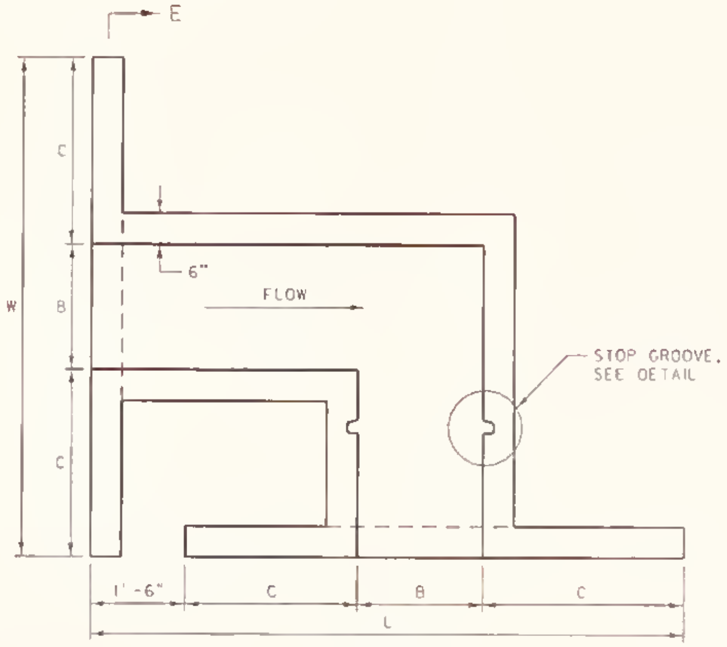
TRASHGUARD FOR CONCRETE
IRRIGATION INLET AND OUTLET
TRANSITION STRUCTURES

EFFECTIVE: AUGUST 1999

MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



PLAN
TYPE I



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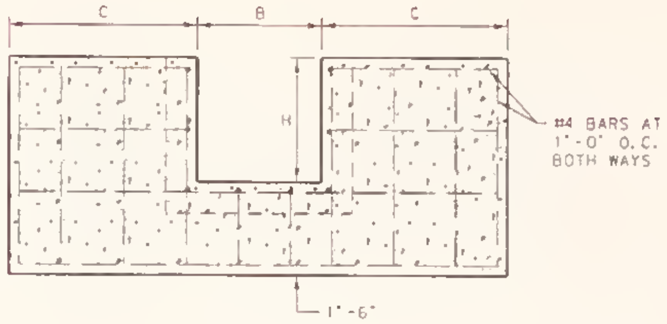
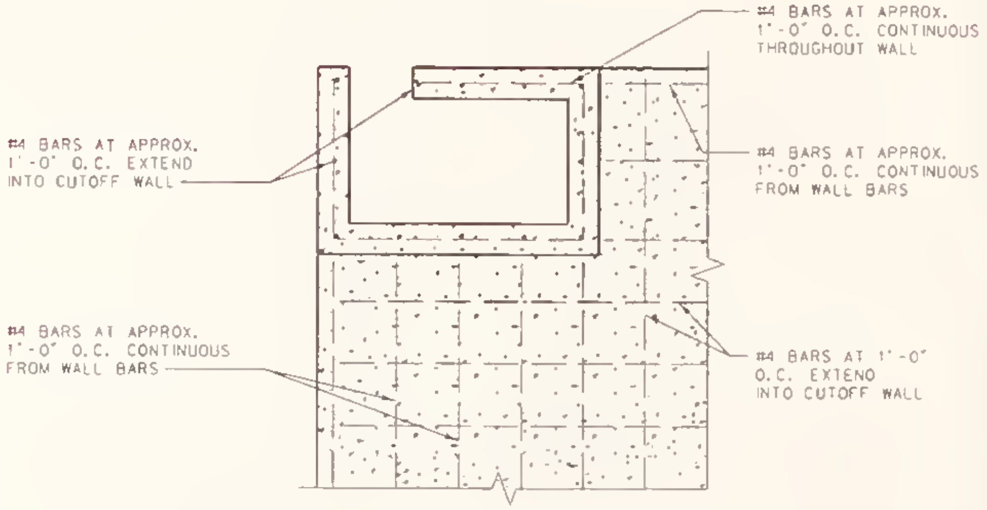
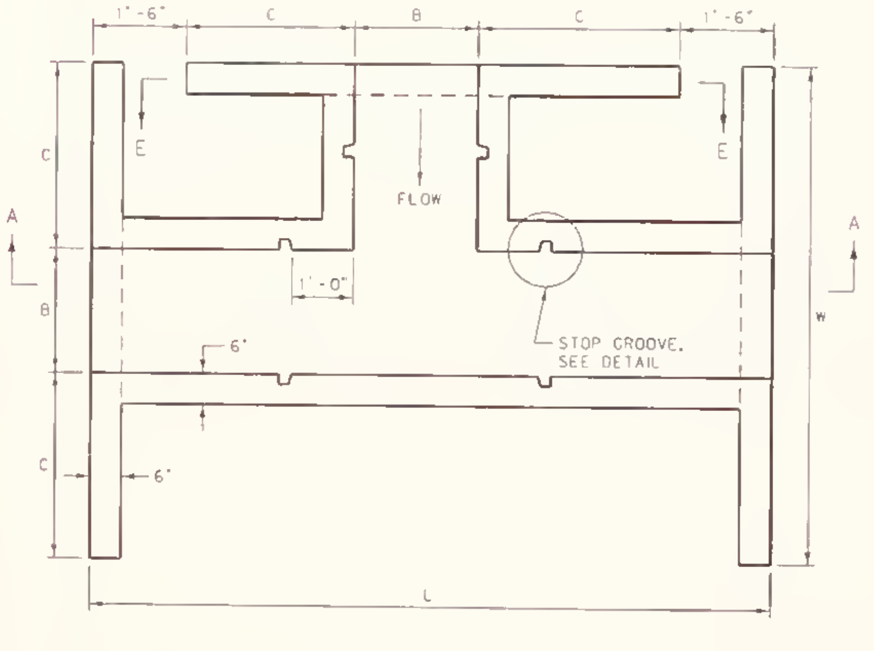
TYPE II



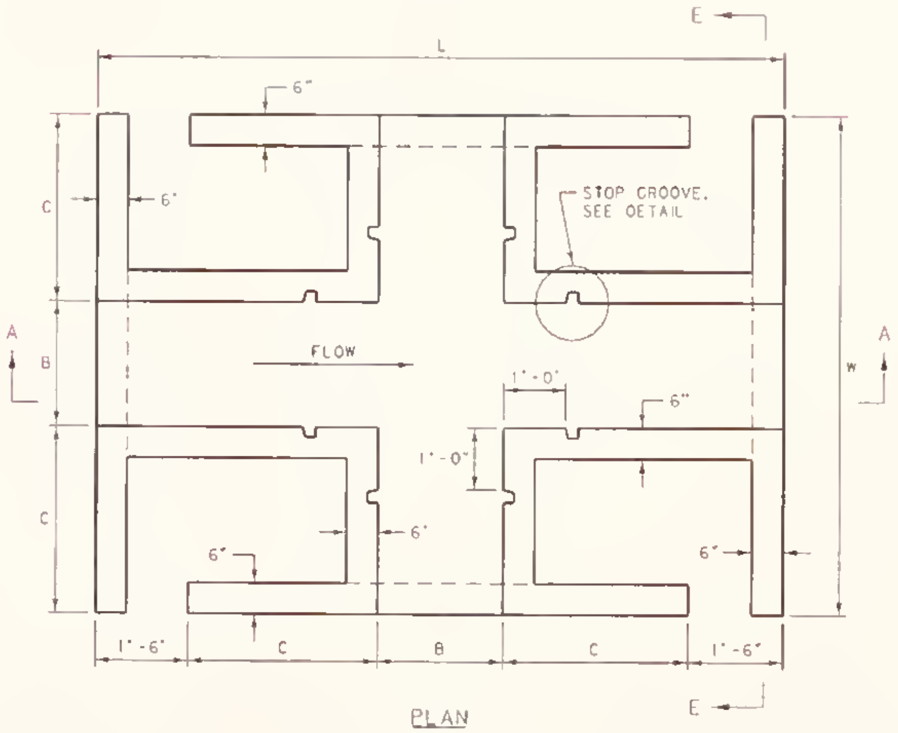
SECTION E-E


F
#4 BARS AT APPROX. 1'-0" O.C. CONTINUOUS THROUGHOUT WALL
#4 BARS AT APPROX. 1'-0" O.C. EXTEND INTO CUTOFF WALL
#4 BARS AT APPROX. 1'-0" O.C. CONTINUOUS FROM WALL BARS
#4 BARS AT APPROX. 1'-0" O.C. CONTINUOUS FROM WALL BARS
#4 BARS AT 1'-0" O.C. EXTEND INTO CUTOFF WALL

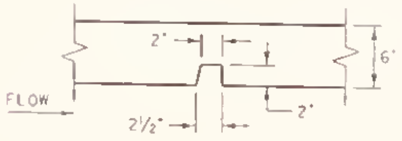
SECTION F-F



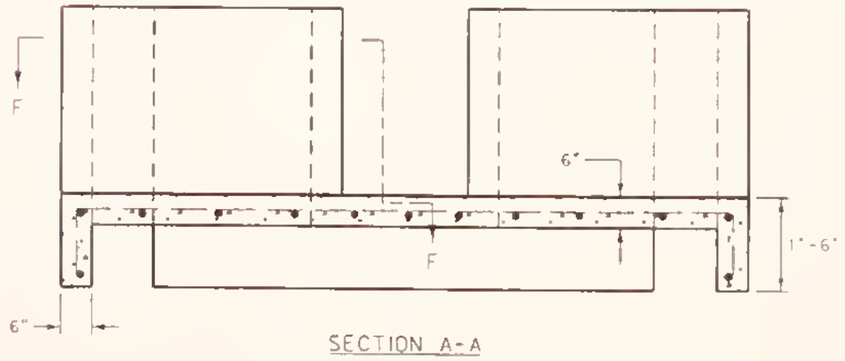
PLAN
TYPE III



PLAN
TYPE IV



STOP GROOVE DETAIL



SECTION A-A

DIMENSIONS AND QUANTITIES							
	B	C	H	L	W	"DD" CONC. OR EQUAL (C.Y.)	REINFORCING STEEL (LB.)
TYPE I	2'-0"	3'-0"	2'-0"	6'-0"	8'-0"	1.5	114.0
	2'-6"	3'-6"	2'-0"	6'-0"	9'-6"	1.7	124.4
	3'-0"	4'-0"	2'-6"	6'-0"	11'-0"	2.2	129.0
TYPE II	2'-0"	3'-0"	2'-0"	9'-6"	8'-0"	2.0	152.0
	2'-6"	3'-6"	2'-0"	11'-0"	9'-6"	2.4	190.0
	3'-0"	4 -0"	2'-6"	12'-6"	11'-0"	3.3	250.8
TYPE III	2'-0"	3 -0"	2'-0"	11'-0"	8'-0"	2.8	212.8
	2'-6"	3 -6"	2'-0"	12'-6"	9'-6"	3.4	258.4
	3'-0"	4'-0"	2'-6"	14'-0"	11'-0"	4.6	349.6
TYPE IV	2'-0"	3'-0"	2'-0"	11'-0"	8'-0"	3.4	266.0
	2'-6"	3'-6"	2'-0"	12'-6"	9'-6"	4.2	319.2
	3'-0"	4'-0"	2'-6"	14'-0"	11'-0"	5.6	425.6

NOTES:

DIVISION BOX MAY BE MODIFIED IF DESIRED WITH DIMENSIONS SHOWN ON THE PLANS.

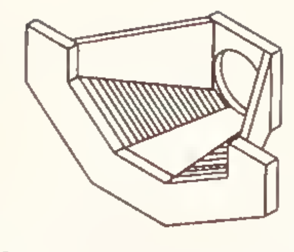
QUANTITIES ARE FOR ESTIMATING PURPOSES ONLY.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 552, 615
DWG. NO.
615-04

STANDARD CONCRETE
IRRIGATION DIVISION BOXES

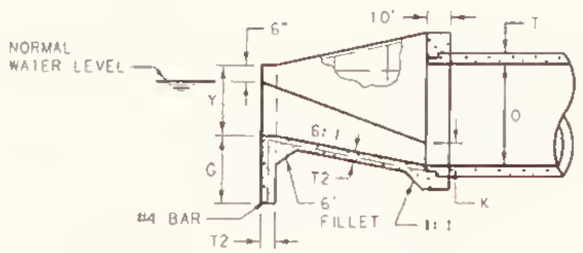
EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



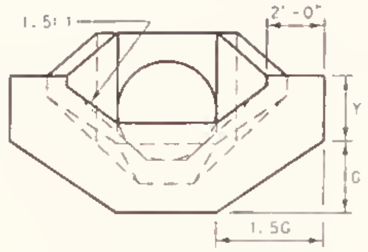
ISOMETRIC VIEW OF TRANSITION

PLACE REBAR IN CENTER OF WALLS, SLAB, ETC. UNLESS OTHERWISE SPECIFIED.

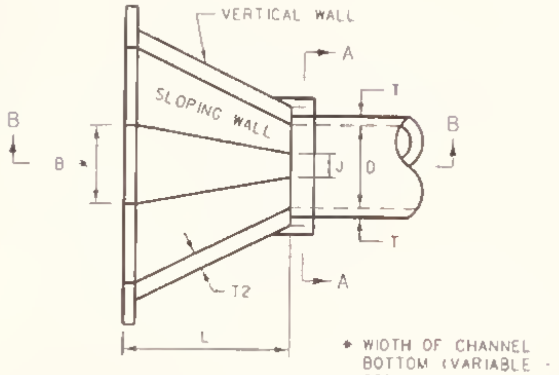


SECTION B-B

SPACE REINFORCING BARS APPROX. 12" EACH WAY THROUGHOUT STRUCTURE. USE CONTINUOUS BARS IN FLOORS AND WALLS WHENEVER POSSIBLE. WHEN SPLICES ARE MADE, LAP REINFORCING BAR 1'-6".

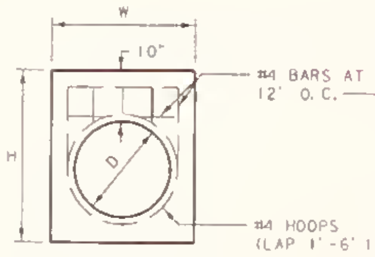


ELEVATION

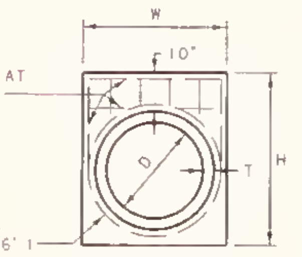


* WIDTH OF CHANNEL BOTTOM (VARIABLE - SEE TABLE)

PLAN VIEW



SECTION A-A
FOR CSP



SECTION A-A
FOR RCP

CHAMFER ALL EXPOSED CORNERS TO 1".

INLET AND OUTLET CONCRETE TRANSITIONS FOR CSP

CULVERT		DIMENSIONS								QUANTITIES								
										B = D			B = D + 1'-0"			B = D + 2'-0"		
DIA. D	AREA (SQ. FT.)	J	H	L	T2	W	K	Y	G	B	CL "DD" CONC. (C.Y.)	#4 REBAR (LB.)	B	CL "DD" CONC. (C.Y.)	#4 REBAR (LB.)	B	CL "DD" CONC. (C.Y.)	#4 REBAR (LB.)
18"	1.77	0.45'	3'-5"	3'-0"	6"	2'-9"	0.35'	1'-3"	2'-0"	1'-6"	0.8	66	2'-6"	0.9	73	3'-6"	1.0	81
24"	3.14	0.61'	4'-0"	4'-0"	6"	3'-3"	0.46'	1'-6"	2'-0"	2'-0"	1.2	94	3'-0"	1.3	103	4'-0"	1.4	112
30"	4.91	0.76'	4'-6"	5'-0"	6"	3'-9"	0.58'	1'-9"	2'-0"	2'-6"	1.6	124	3'-6"	1.7	134	4'-6"	1.8	144
36"	7.07	0.91'	5'-1"	6'-0"	6"	4'-3"	0.70'	2'-0"	2'-6"	3'-0"	2.1	162	4'-0"	2.2	173	5'-0"	2.3	184
42"	9.62	1.10'	5'-8"	7'-0"	6"	4'-9"	0.81'	2'-3"	2'-6"	3'-6"	2.6	200	4'-6"	2.7	212	5'-6"	2.9	225
48"	12.57	1.20'	6'-3"	8'-0"	8"	5'-3"	0.93'	2'-6"	2'-6"	4'-0"	4.1	245	5'-0"	4.3	259	6'-0"	4.4	272

INLET AND OUTLET CONCRETE TRANSITIONS FOR RCP

CULVERT		DIMENSIONS									QUANTITIES								
											B = D			B = D + 1'-0"			B = D + 2'-0"		
DIA. D	AREA (SQ. FT.)	J	H	L	T	T2	W	K	Y	G	B	CL "DD" CONC. (C.Y.)	#4 REBAR (LB.)	B	CL "DD" CONC. (C.Y.)	#4 REBAR (LB.)	B	CL "DD" CONC. (C.Y.)	#4 REBAR (LB.)
18"	1.77	0.45	3'-8"	3'-0"	2½"	6"	3'-2"	0.35	1'-3"	2'-0"	1'-6"	0.9	68	2'-6"	1.0	76	3'-6"	83	1.0
24"	3.14	0.61	4'-3"	4'-0"	3"	6"	3'-9"	0.46'	1'-6"	2'-0"	2'-0"	1.2	98	3'-0"	1.3	107	4'-0"	116	1.4
30"	4.91	0.76'	4'-10"	5'-0"	3½"	6"	4'-4"	0.58'	1'-9"	2'-0"	2'-6"	1.7	128	3'-6"	1.8	138	4'-6"	149	1.9
36"	7.07	0.91	5'-6"	6'-0"	4"	6"	4'-11"	0.70'	2'-0"	2'-6"	3'-0"	2.2	168	4'-0"	2.3	179	5'-0"	190	2.4
42"	9.62	1.10'	6'-1"	7'-0"	4½"	6"	5'-6"	0.81'	2'-3"	2'-6"	3'-6"	2.7	212	4'-6"	2.8	224	5'-6"	237	2.9
48"	12.57	1.20	6'-8"	8'-0"	5"	8"	6'-1"	0.93'	2'-6"	2'-6"	4'-0"	4.2	254	5'-0"	4.3	267	6'-0"	287	4.6

NOTES:

INSTALL STRUCTURES OUTSIDE THE CLEAR ZONE.

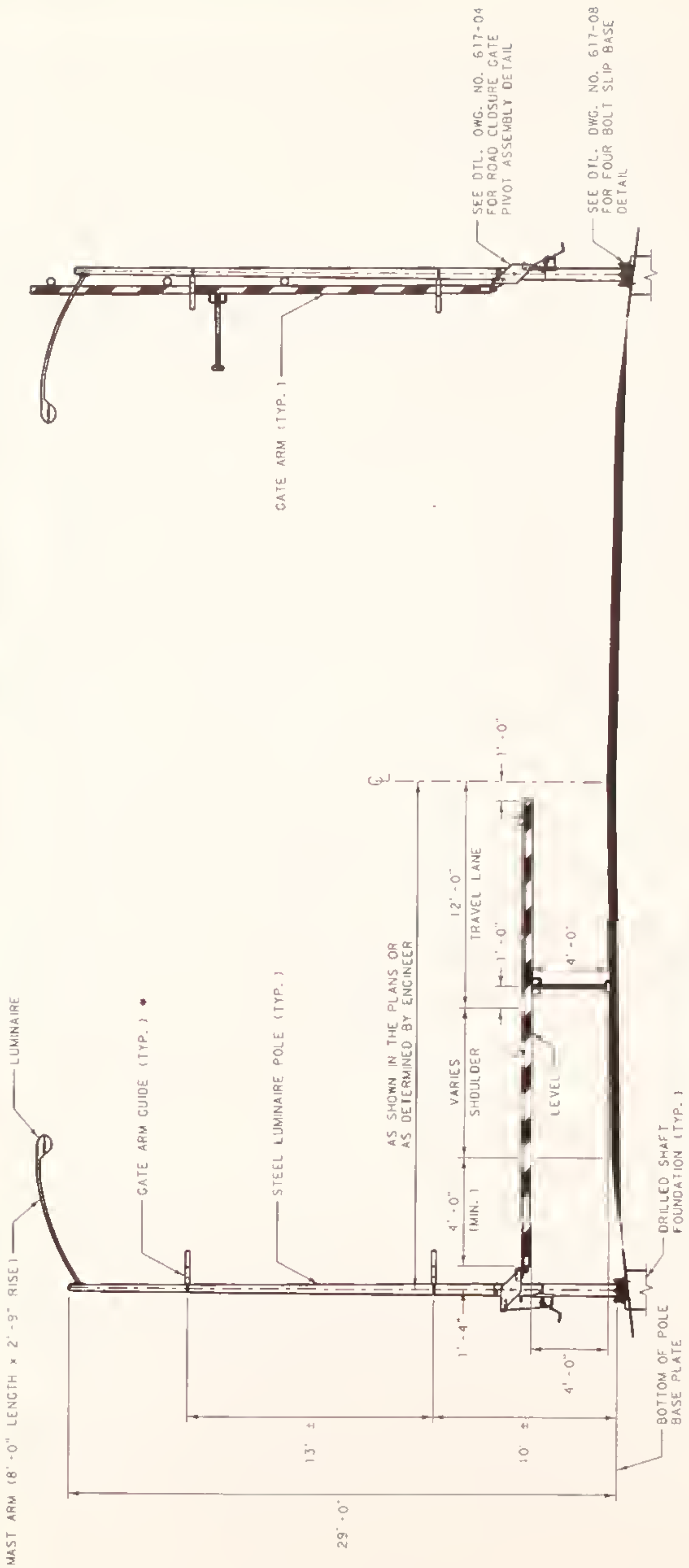
PROVIDE TRASHRACKS WHEN REQUIRED. SEE DTL. DWG. NO. 615-02.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 615
DWG. NO.
615-06

CONCRETE IRRIGATION INLET AND OUTLET TRANSITION FOR RCP AND CSP PIPES

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

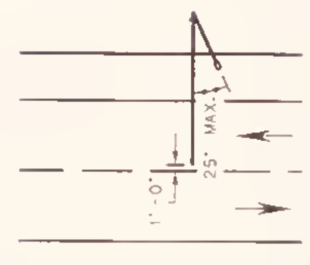


SEE DTL. DWG. NO. 617-04 FOR ROAD CLOSURE GATE PIVOT ASSEMBLY DETAIL
SEE DTL. DWG. NO. 617-08 FOR FOUR BOLT SLIP BASE DETAIL
GATE ARM (TYP.)
LUMINAIRE
GATE ARM GUIDE (TYP.) *
STEEL LUMINAIRE POLE (TYP.)
AS SHOWN IN THE PLANS OR AS DETERMINED BY ENGINEER
℄
1'-0"
12'-0"
TRAVEL LANE
1'-0"
4'-0"
VARIES
SHOULDER
LEVEL
4'-0" (MIN.)
1'-4"
4'-0"
MAST ARM (8'-0" LENGTH x 2'-9" RISE)
13' ±
10' ±
29'-0"
DRILLED SHAFT FOUNDATION (TYP.)
BOTTOM OF POLE BASE PLATE

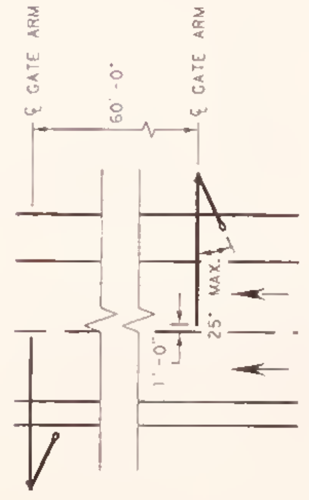
TYPICAL RAISED POSITION

TYPICAL LOWERED POSITION

ELEVATION
DIVIDED HIGHWAY INSTALLATION SHOWN



TYPICAL TWO-WAY, TWO-LANE INSTALLATION
(1 GATE REQUIRED)



TYPICAL DIVIDED HIGHWAY INSTALLATION
(2 GATES REQUIRED)

NOTES:

- * HEIGHT OF GATE ARM GUIDES MAY VARY AS REQUIRED FOR WARNING LIGHT CLEARANCES.

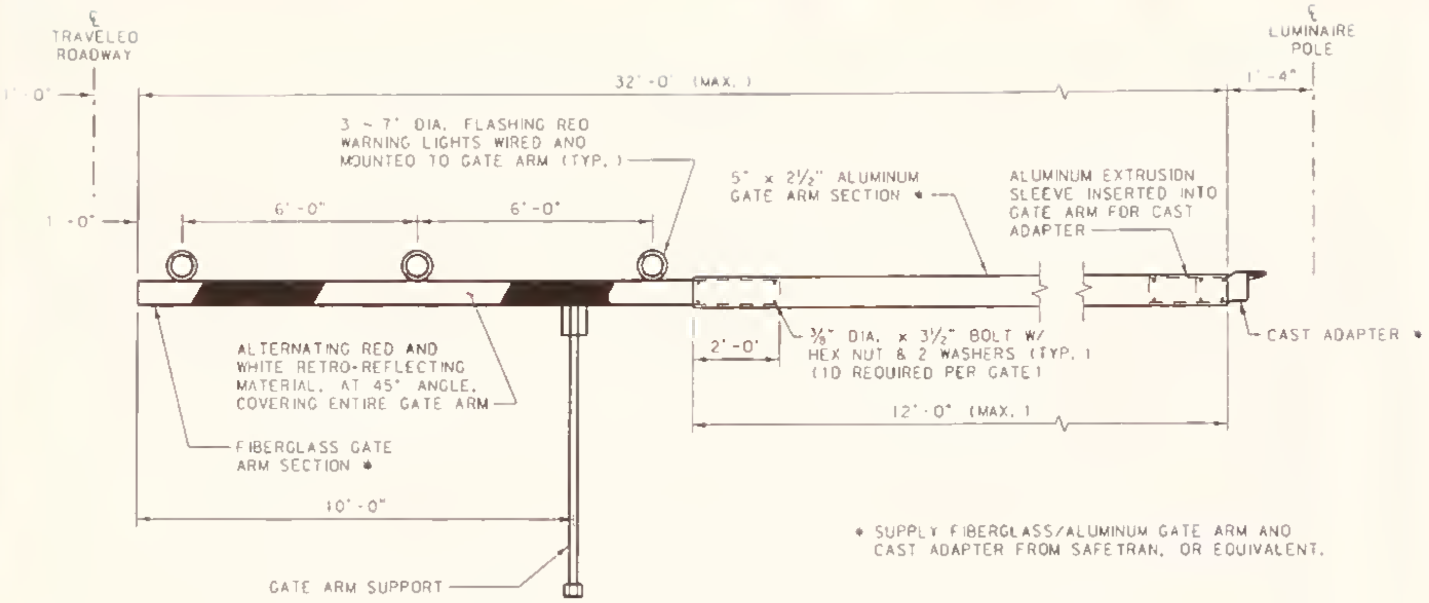
SEE DTL. DWG. NO. 617-02 FOR ADDITIONAL ROAD CLOSURE GATE DETAILS.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 617
DWG. NO.
617-00

ROAD CLOSURE GATE

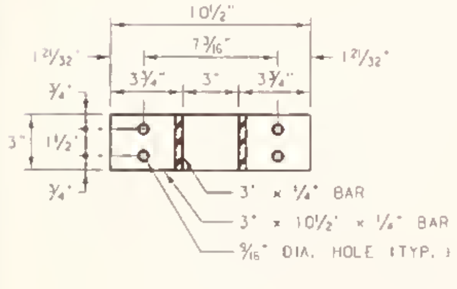
EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

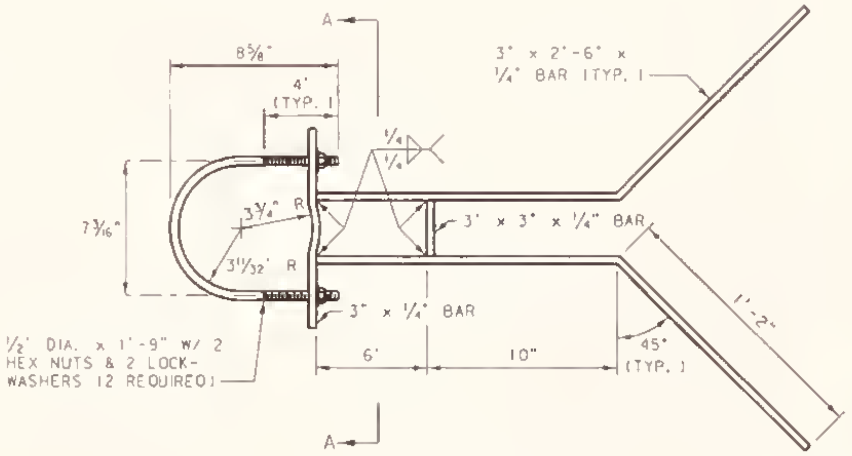

℄ TRAVELED ROADWAY
℄ LUMINAIRE POLE
1'-0"
1'-0"
32'-0" (MAX.)
1'-4"
3 ~ 7" DIA. FLASHING RED WARNING LIGHTS WIRED AND MOUNTED TO GATE ARM (TYP.)
5" x 2½" ALUMINUM GATE ARM SECTION *
ALUMINUM EXTRUSION SLEEVE INSERTED INTO GATE ARM FOR CAST ADAPTER
6'-0"
6'-0"
CAST ADAPTER *
2'-0"
⅜" DIA. x 3½" BOLT W/ HEX NUT & 2 WASHERS (TYP.) (10 REQUIRED PER GATE)
12'-0" (MAX.)
ALTERNATING RED AND WHITE RETRO-REFLECTING MATERIAL, AT 45° ANGLE, COVERING ENTIRE GATE ARM
FIBERGLASS GATE ARM SECTION *
10'-0"
GATE ARM SUPPORT

* SUPPLY FIBERGLASS/ALUMINUM GATE ARM AND CAST ADAPTER FROM SAFETRAN, OR EQUIVALENT.

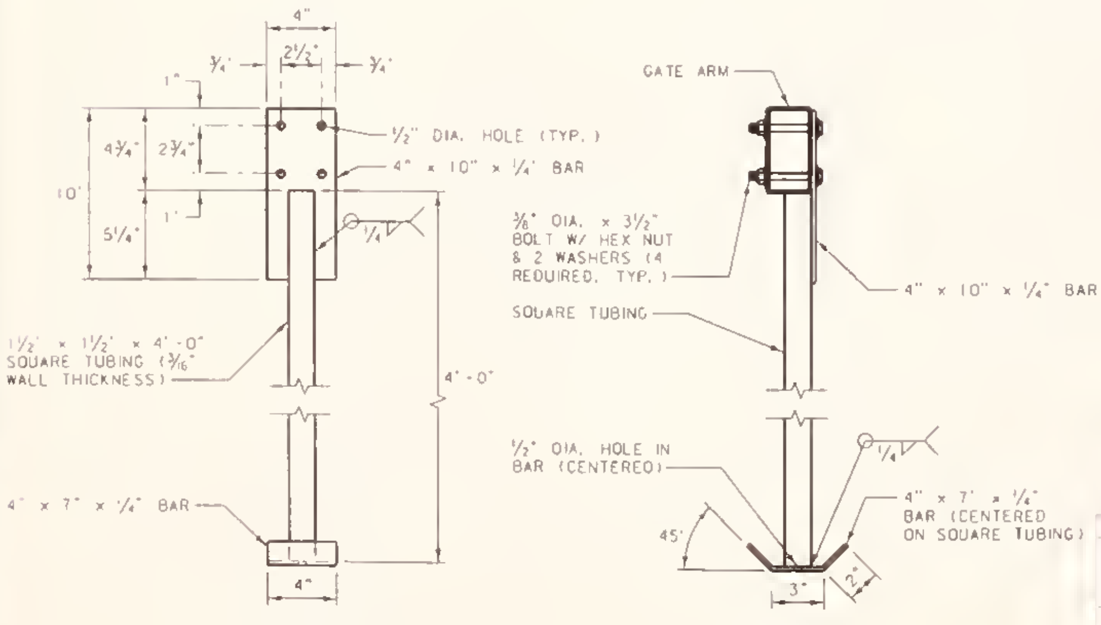
GATE ARM



SECTION A-A
(U-BOLTS NOT SHOWN)


A
8⅝"
4" (TYP.)
3" x 2'-6" x ¼" BAR (TYP.)
¼
¼
7³⁄₁₆"
3¾" R
3¹¹⁄₃₂" R
3" x 3" x ¼" BAR
3" x ¼" BAR
½" DIA. x 1'-9" W/ 2 HEX NUTS & 2 LOCK-WASHERS (2 REQUIRED)
6"
10"
45° (TYP.)
1'-2"
A

GATE ARM GUIDE


4"
2½"
¾"
¾"
1"
4¾"
2¾"
10"
1"
5¼"
½" DIA. HOLE (TYP.)
4" x 10" x ¼" BAR
¼
1½" x 1½" x 4'-0" SQUARE TUBING (³⁄₁₆" WALL THICKNESS)
4'-0"
4" x 7" x ¼" BAR
4"
GATE ARM
⅜" DIA. x 3½" BOLT W/ HEX NUT & 2 WASHERS (4 REQUIRED, TYP.)
4" x 10" x ¼" BAR
SQUARE TUBING
½" DIA. HOLE IN BAR (CENTERED)
¼
4" x 7" x ¼" BAR (CENTERED ON SQUARE TUBING)
45°
3"
2"

ELEVATION
(GATE ARM AND BOLTS NOT SHOWN)

RIGHT SIDE

GATE ARM SUPPORT

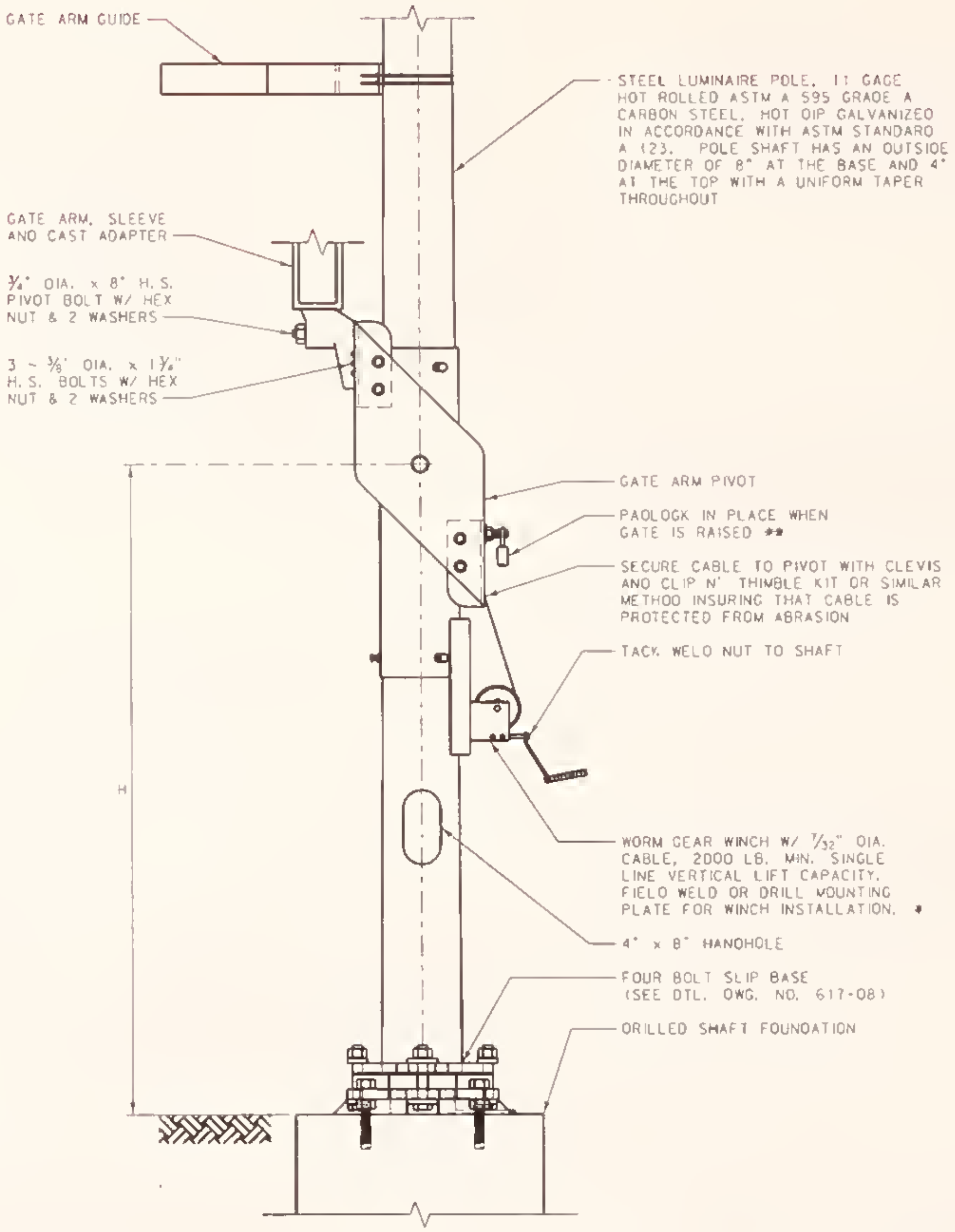
DETAILED DRAWING

REFERENCE	DWG. NO.
STANDARD SPEC. SECTION 617	617-02

ROAD CLOSURE GATE
DETAILS

EFFECTIVE: AUGUST 1999

MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD


GATE ARM GUIDE
STEEL LUMINAIRE POLE, 11 GAGE HOT ROLLED ASTM A 595 GRADE A CARBON STEEL, HOT DIP GALVANIZED IN ACCORDANCE WITH ASTM STANDARD A 123. POLE SHAFT HAS AN OUTSIDE DIAMETER OF 8" AT THE BASE AND 4" AT THE TOP WITH A UNIFORM TAPER THROUGHOUT
GATE ARM, SLEEVE AND CAST ADAPTER
¾" DIA. x 8" H.S. PIVOT BOLT W/ HEX NUT & 2 WASHERS
3 ~ ⅜" DIA. x 1¾" H.S. BOLTS W/ HEX NUT & 2 WASHERS
GATE ARM PIVOT
PADLOCK IN PLACE WHEN GATE IS RAISED **
SECURE CABLE TO PIVOT WITH CLEVIS AND CLIP N' THIMBLE KIT OR SIMILAR METHOD INSURING THAT CABLE IS PROTECTED FROM ABRASION
TACK WELD NUT TO SHAFT
H
WORM GEAR WINCH W/ ⁷⁄₃₂" DIA. CABLE, 2000 LB. MIN. SINGLE LINE VERTICAL LIFT CAPACITY. FIELD WELD OR DRILL MOUNTING PLATE FOR WINCH INSTALLATION. *
4" x 8" HANDHOLE
FOUR BOLT SLIP BASE (SEE DTL. DWG. NO. 617-08)
DRILLED SHAFT FOUNDATION

ROAD CLOSURE GATE
PIVOT ASSEMBLY

NOTES:

SEE DTL. DWG. NO. 617-06 FOR PIVOT ASSEMBLY DETAILS.

MOUNTING HEIGHT (H) WILL BE SHOWN IN THE PLANS OR SPECIFIED BY THE ENGINEER TO PROVIDE FOR THE PROPER HEIGHT OF THE GATE ABOVE THE ROADWAY.

ALL BOLTS DESIGNATED H.S. (HIGH STRENGTH) ARE TO CONFORM TO ASTM A 325. AFTER ROAD CLOSURE GATE ASSEMBLY, PAINT ALL EXPOSED BOLT THREADS OR DAMAGE TO THE GALVANIZING WITH TWO COATS OF ZINC RICH PAINT CONFORMING TO ASTM A 780.

* SUPPLY WORM GEAR WINCH AND CABLE FROM DUTTON - LAINSON (STOCK NUMBER 42183), OR EQUIVALENT.

** WHEN THE GATE IS FULLY RAISED, PLACE THE NUT AND WASHER SNUGLY AGAINST THE OUTSIDE OF THE REAR CHANNEL AND PADLOCK IN PLACE. SUPPLY ONE HEAVY, WEATHERPROOF PADLOCK WITH 2 KEYS FOR EACH GATE ARM PIVOT. KEY PAIRED PIVOTS (DIVIDED HIGHWAY INSTALLATION) ALIKE.

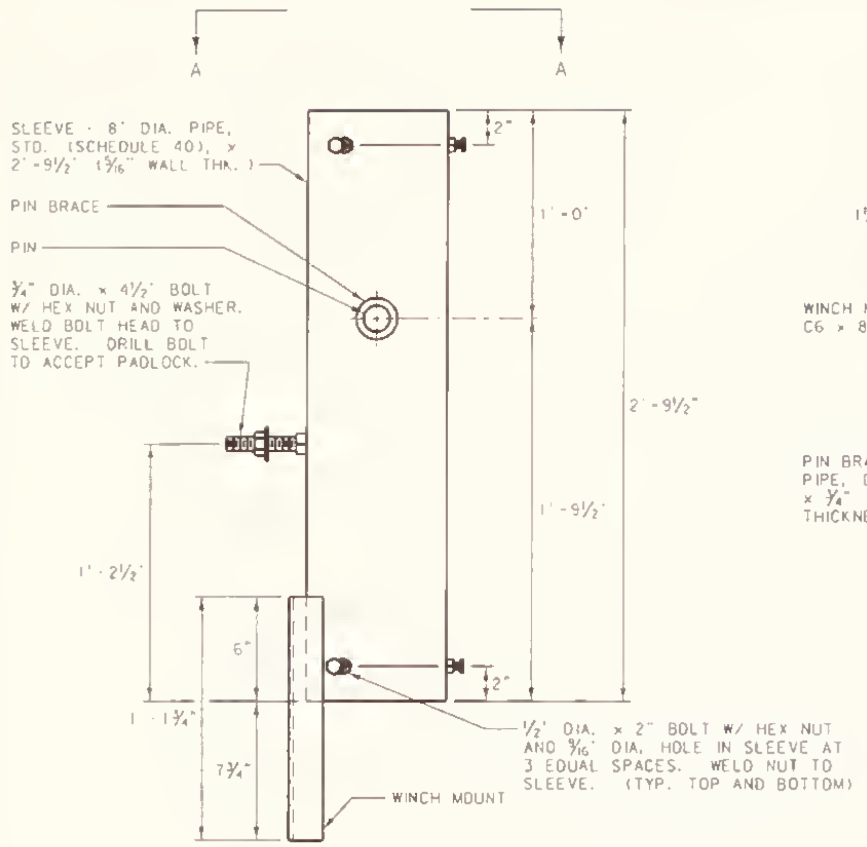
DETAILED DRAWING

REFERENCE	DWG. NO.
STANDARD SPEC. SECTION 617	617-04

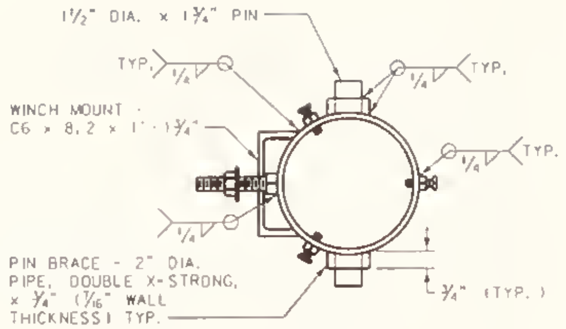
ROAD CLOSURE GATE
PIVOT ASSEMBLY

EFFECTIVE: AUGUST 1999

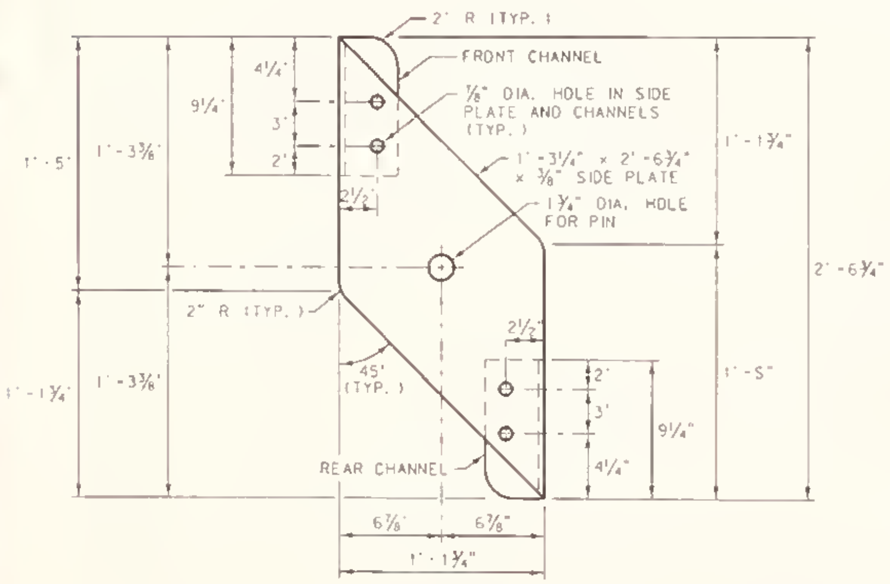
MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD


A
A
SLEEVE - 8" DIA. PIPE, STD. (SCHEDULE 40), × 2'-9½" (5⁄16" WALL THK.)
PIN BRACE
PIN
¾" DIA. × 4½" BOLT W/ HEX NUT AND WASHER. WELD BOLT HEAD TO SLEEVE. DRILL BOLT TO ACCEPT PADLOCK.
2"
1'-0"
2'-9½"
1'-9½"
1'-2½"
6"
2"
1'-1¾"
7¾"
½" DIA. × 2" BOLT W/ HEX NUT AND 9⁄16" DIA. HOLE IN SLEEVE AT 3 EQUAL SPACES. WELD NUT TO SLEEVE. (TYP. TOP AND BOTTOM)
WINCH MOUNT

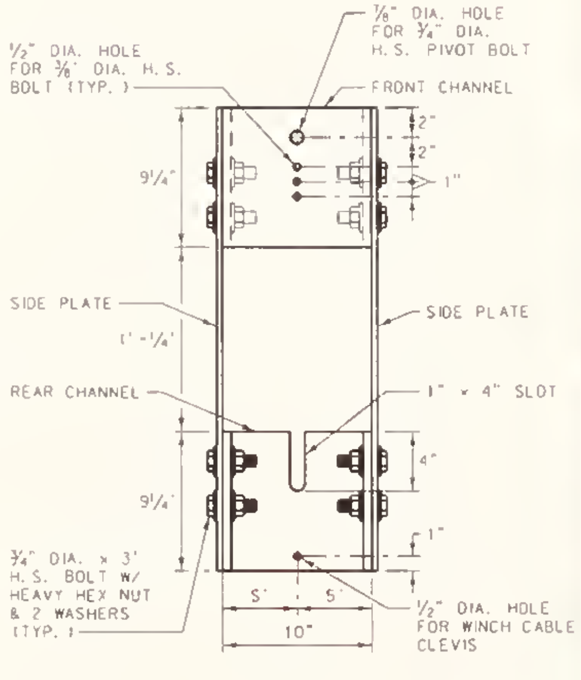
PIVOT SLEEVE


1½" DIA. × 1¾" PIN
TYP.
¼
TYP.
¼
WINCH MOUNT - C6 × 8.2 × 1'-1¾"
TYP.
¼
¼
PIN BRACE - 2" DIA. PIPE, DOUBLE X-STRONG, × ¾" (7⁄16" WALL THICKNESS) TYP.
¾" (TYP.)

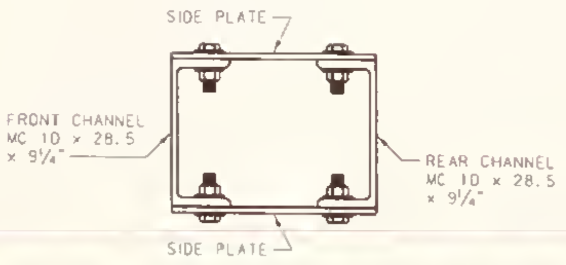
VIEW A-A



ELEVATION


½" DIA. HOLE FOR ⅜" DIA. H.S. BOLT (TYP.)
⅞" DIA. HOLE FOR ¾" DIA. H.S. PIVOT BOLT
FRONT CHANNEL
2"
2"
1"
9¼"
SIDE PLATE
1'-¼"
SIDE PLATE
REAR CHANNEL
1" × 4" SLOT
4"
9¼"
1"
¾" DIA. × 3" H.S. BOLT W/ HEAVY HEX NUT & 2 WASHERS (TYP.)
5"
5"
10"
½" DIA. HOLE FOR WINCH CABLE CLEVIS

END VIEW


SIDE PLATE
FRONT CHANNEL MC 10 × 28.5 × 9¼"
REAR CHANNEL MC 10 × 28.5 × 9¼"
SIDE PLATE

PLAN

SIDE PLATE

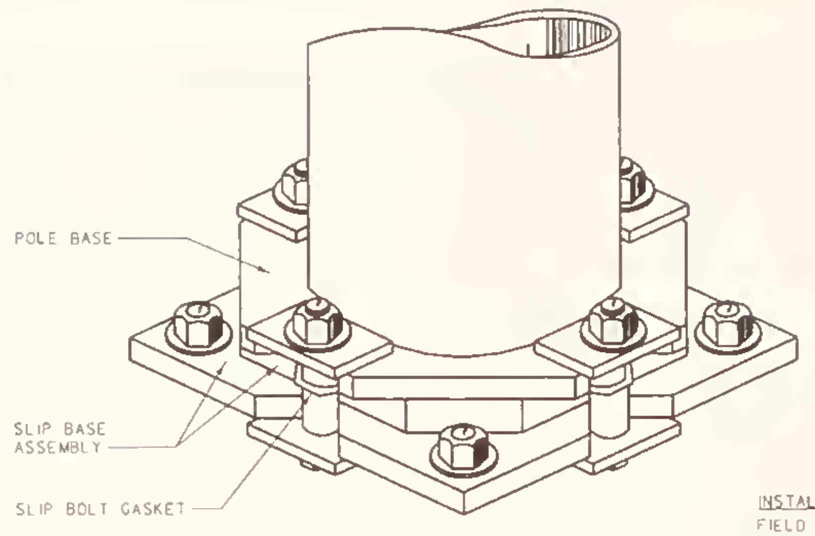
DETAILED DRAWING

REFERENCE STANDARD SPEC. SECTION 617	DWG. NO. 617-06

ROAD CLOSURE GATE
PIVOT ASSEMBLY
DETAILS

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



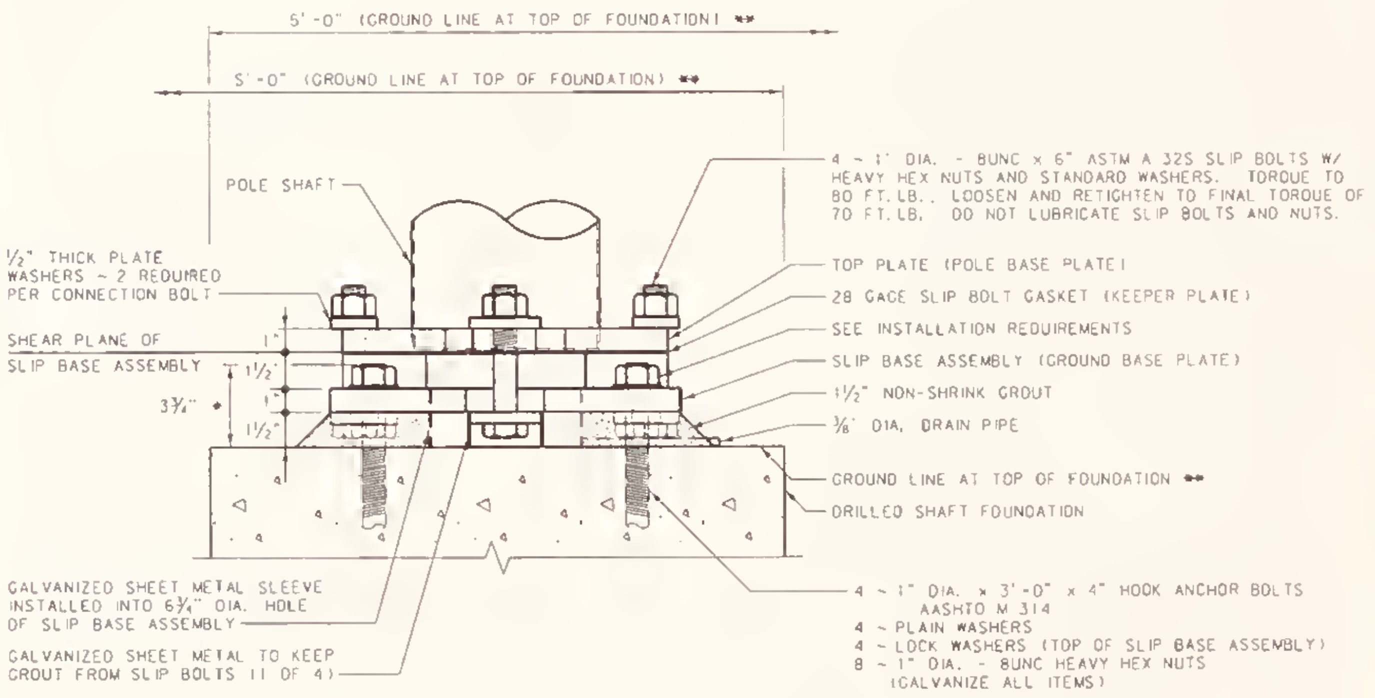
ISOMETRIC VIEW

* TOP OF ANCHOR BOLTS MUST BE BELOW SHEAR PLANE.

** IT IS CRITICAL THAT THE GROUND SURROUNDING THE CONCRETE FOUNDATION BE GRADED AND CONTOURED TO PREVENT VEHICLE UNDERCARRIAGE SNAGGING. ALL POINTS ON THE GROUND SURFACE ARE TO BE AT THE TOP OF THE FOUNDATION WITHIN ANY 5'-0" HORIZONTAL DISTANCE EXTENDING OVER THE SLIP BASE AS SHOWN, AND ALIGNING PERPENDICULAR TO THE ROADWAY CENTERLINE OR ON A RADIAL LINE FOR A CURVED ROADWAY.

INSTALLATION REQUIREMENTS FOR TOP NUTS OF ANCHOR BOLTS

FIELD LUBRICATE BEARING FACE AND THREADS OF TOP ANCHOR BOLT NUTS WITH A STICK WAX. TIGHTEN TOP NUTS TO SNUG-TIGHT. SNUG-TIGHT IS DEFINED AS THE TIGHTNESS THAT EXISTS WHEN THE GROUND BASE PLATE IS IN FIRM CONTACT WITH THE TOP AND BOTTOM NUTS, AND IS ATTAINED BY THE FULL EFFORT OF A MAN USING AN ORDINARY SPUD WRENCH. AFTER THE SNUG-TIGHT CONDITION IS ATTAINED, ROTATE THE TOP NUTS AN ADDITIONAL 45° (+20°, -0°).


5'-0" (GROUND LINE AT TOP OF FOUNDATION) **
5'-0" (GROUND LINE AT TOP OF FOUNDATION) **
POLE SHAFT
4 ~ 1" DIA. - 8UNC × 6" ASTM A 325 SLIP BOLTS W/ HEAVY HEX NUTS AND STANDARD WASHERS. TORQUE TO 80 FT.LB., LOOSEN AND RETIGHTEN TO FINAL TORQUE OF 70 FT.LB. DO NOT LUBRICATE SLIP BOLTS AND NUTS.
½" THICK PLATE WASHERS ~ 2 REQUIRED PER CONNECTION BOLT
TOP PLATE (POLE BASE PLATE)
28 GAGE SLIP BOLT GASKET (KEEPER PLATE)
SHEAR PLANE OF SLIP BASE ASSEMBLY
1"
1½"
1"
1½"
3¾" *
SEE INSTALLATION REQUIREMENTS
SLIP BASE ASSEMBLY (GROUND BASE PLATE)
1½" NON-SHRINK GROUT
⅜" DIA. DRAIN PIPE
GROUND LINE AT TOP OF FOUNDATION **
DRILLED SHAFT FOUNDATION
GALVANIZED SHEET METAL SLEEVE INSTALLED INTO 6¾" DIA. HOLE OF SLIP BASE ASSEMBLY
GALVANIZED SHEET METAL TO KEEP GROUT FROM SLIP BOLTS (1 OF 4)
4 ~ 1" DIA. × 3'-0" × 4" HOOK ANCHOR BOLTS AASHTO M 314
4 ~ PLAIN WASHERS
4 ~ LOCK WASHERS (TOP OF SLIP BASE ASSEMBLY)
8 ~ 1" DIA. - 8UNC HEAVY HEX NUTS
(GALVANIZE ALL ITEMS)

FOUR BOLT SLIP BASE

NOTES:

SEE DTL. DWG. NO. 617-10 FOR FOUR BOLT SLIP BASE DETAILS AND DRILLED SHAFT FOUNDATION.

CONFORM SLIP BOLT GASKET (KEEPER PLATE) TO ASTM A 653 GRADE 33 WITH COATING ASTM G 90.

CONFORM ALL PLATES TO ASTM A 709 (GRADE 36) OR AASHTO M 270.

GALVANIZE ALL STRUCTURAL STEEL AFTER FABRICATION ACCORDING TO ASTM A 123. ALL CONTACT AREAS OF STRUCTURAL STEEL ARE TO BE FREE OF GALVANIZING BEADS AND RUNS.

ELECTRO-PLATE ALL CONNECTING HARDWARE (HIGH STRENGTH BOLTS, HEAVY HEX NUTS AND STD. WASHERS) WITH CADMIUM IN ACCORDANCE WITH ASTM B 766 CLASS 12.

DO NOT ENCLOSE ANY SLIP BOLT HEADS OR WASHERS IN GROUT AND KEEP THEM COMPLETELY MECHANICALLY ACCESSIBLE, ALLOWING BOLTS TO BE FREELY PUSHED OUT DURING VEHICLE IMPACT.

DETAILED DRAWING

REFERENCE STANDARD SPEC. SECTION 617	DWG. NO. 617-08

FOUR BOLT SLIP BASE

EFFECTIVE: AUGUST [illegible]

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

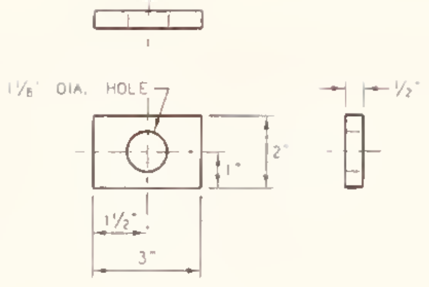
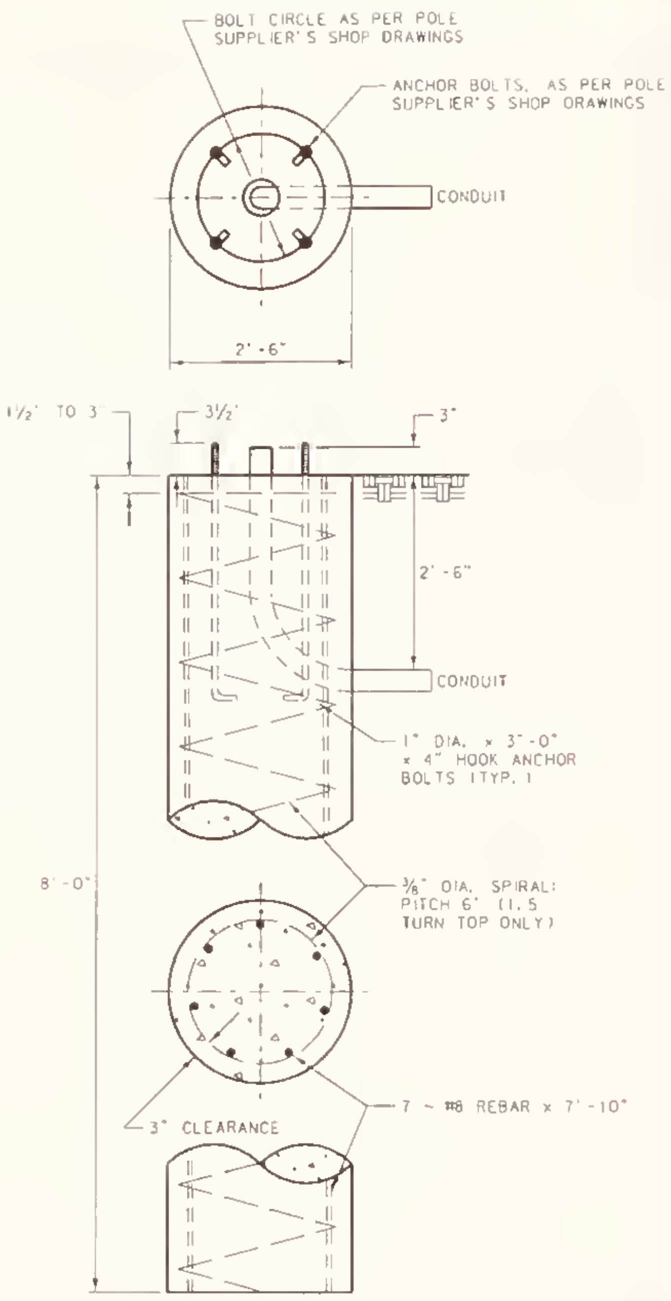
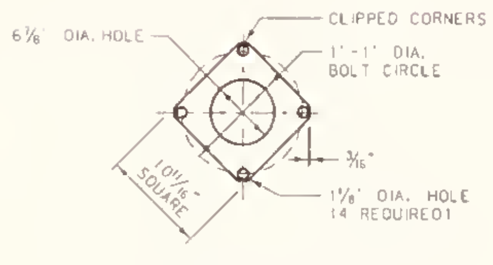


PLATE WASHER


BOLT CIRCLE AS PER POLE SUPPLIER'S SHOP DRAWINGS
ANCHOR BOLTS, AS PER POLE SUPPLIER'S SHOP DRAWINGS
CONDUIT
2'-6"
1½" TO 3"
3½"
3"
2'-6"
CONDUIT
1" DIA. × 3'-0" × 4" HOOK ANCHOR BOLTS (TYP.)
8'-0"
⅜" DIA. SPIRAL: PITCH 6" (1.5 TURN TOP ONLY)
7 ~ #8 REBAR × 7'-10"
3" CLEARANCE

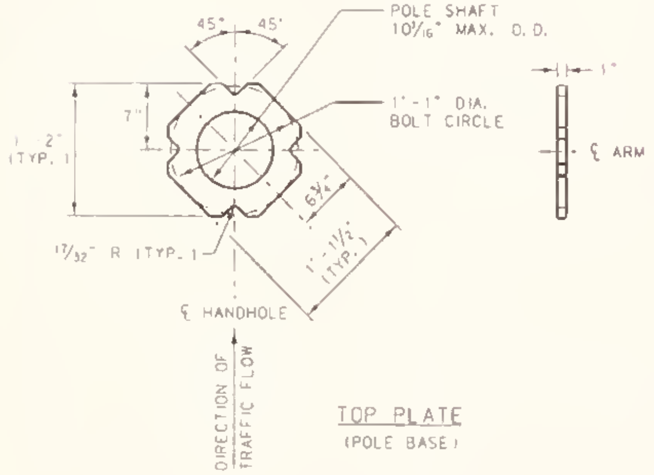
DRILLED SHAFT FOUNDATION

(LUMINAIRE POLE)



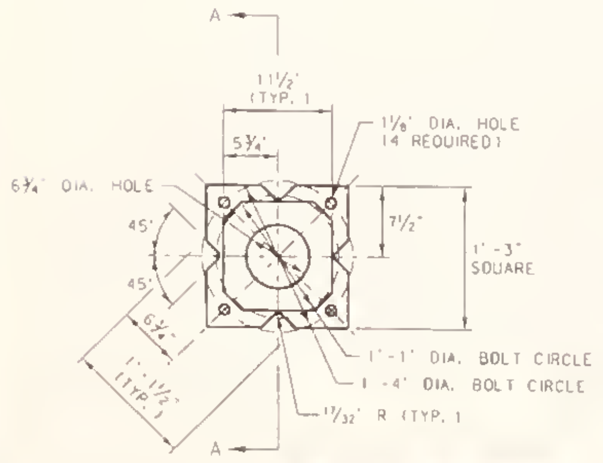
SLIP BOLT GASKET

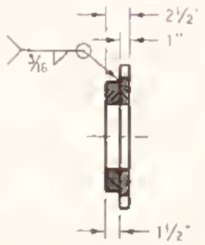
(KEEPER PLATE)



TOP PLATE

(POLE BASE)





SECTION A-A

SLIP BASE ASSEMBLY

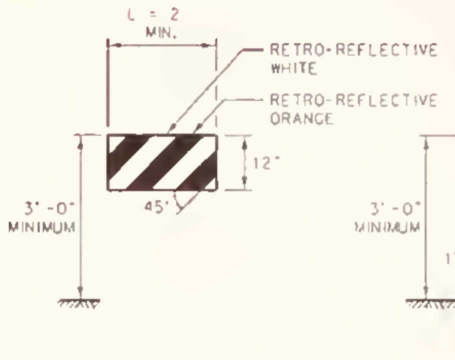
(GROUND BASE PLATE)

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 617
DWG. NO.
617-10

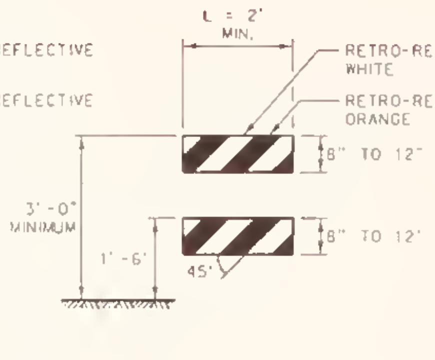
FOUR BOLT SLIP BASE
DETAILS

EFFECTIVE: AUGUST 1999

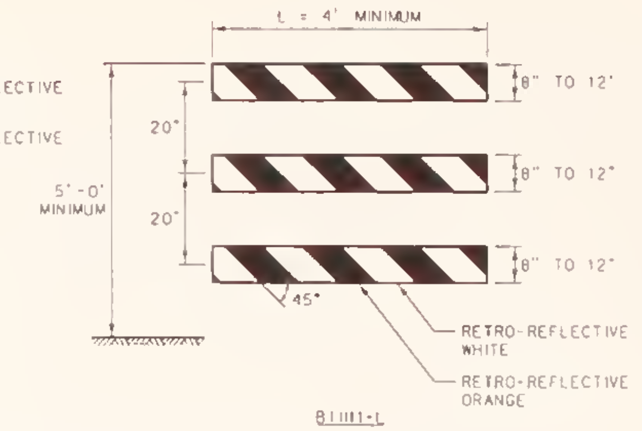
MONTANA DEPARTMENT
OF TRANSPORTATION
MONTANA CADD



B(I)-R



B(II)-R



B(III)-L

RAIL STRIPES ARE 6" IN WIDTH FOR BARRICADES 3' OR GREATER IN LENGTH. FOR BARRICADES LESS THAN 3" IN LENGTH, 4" STRIPES MAY BE USED.

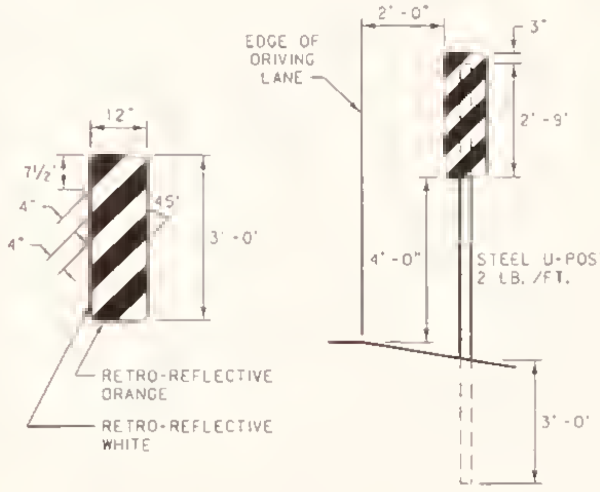
THE PREDOMINANT COLOR FOR OTHER BARRICADE COMPONENTS IS WHITE, BUT UNPAINTED GALVANIZED METAL OR ALUMINUM COMPONENTS MAY BE USED.

WHERE B(III) BARRICADES ARE TO FACE TRAFFIC FROM TWO DIRECTIONS, STRIPING ON BOTH THE FRONT AND REAR SIDES IS REQUIRED.

MATERIALS ACCEPTABLE FOR BARRICADE FRAMEWORK INCLUDE WOOD, LIGHTWEIGHT YIELDING METAL AND LIGHTWEIGHT YIELDING PLASTIC. WOOD USED IN FRAMEWORK FOR BARRICADES MAY NOT EXCEED 2" × 4" IN SIZE. USE STANDARD GRADE (NO. 2) OR BETTER S4S LUMBER.

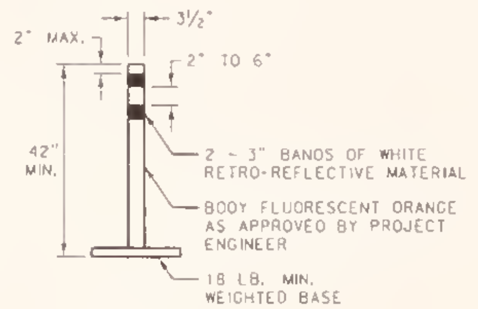
USE SANDBAGS OF SUFFICIENT WEIGHT TO HOLD THE BARRICADES IN PLACE. WATERPROOF SANDBAGS DURING PERIODS OF FREEZING WEATHER.

PORTABLE BARRICADES

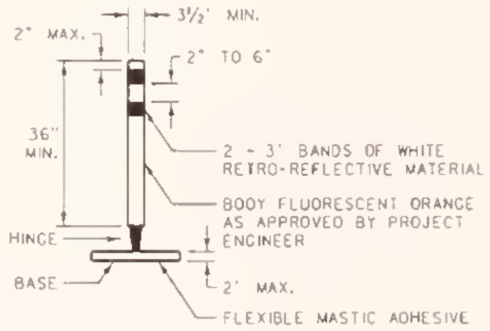


VERTICAL PANEL

(VP-1R SHOWN, REVERSE FOR VP-1L.)

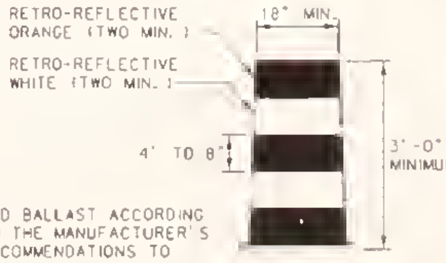

3½"
2" MAX.
2" TO 6"
42" MIN.
2 ~ 3" BANDS OF WHITE RETRO-REFLECTIVE MATERIAL
BODY FLUORESCENT ORANGE AS APPROVED BY PROJECT ENGINEER
18 LB. MIN. WEIGHTED BASE

GUIDE POST


3½" MIN.
2" MAX.
2" TO 6"
36" MIN.
2 ~ 3" BANDS OF WHITE RETRO-REFLECTIVE MATERIAL
BODY FLUORESCENT ORANGE AS APPROVED BY PROJECT ENGINEER
HINGE
BASE
2" MAX.
FLEXIBLE MASTIC ADHESIVE

FLEXIBLE GUIDE POST

(SELF RIGHTING AFTER IMPACT)


RETRO-REFLECTIVE ORANGE (TWO MIN.)
RETRO-REFLECTIVE WHITE (TWO MIN.)
18" MIN.
4" TO 8"
3'-0" MINIMUM

ADD BALLAST ACCORDING TO THE MANUFACTURER'S RECOMMENDATIONS TO HOLD THE DRUM IN PLACE.

DRUMS HAVE CLOSED TOPS.

PLASTIC DRUM

NOTES:

BARRICADES OR VERTICAL PANELS DESIGNATED "R" ARE PLACED TO THE RIGHT SIDE OF APPROACHING TRAFFIC. THOSE DESIGNATED "L" ARE PLACED TO THE LEFT SIDE.

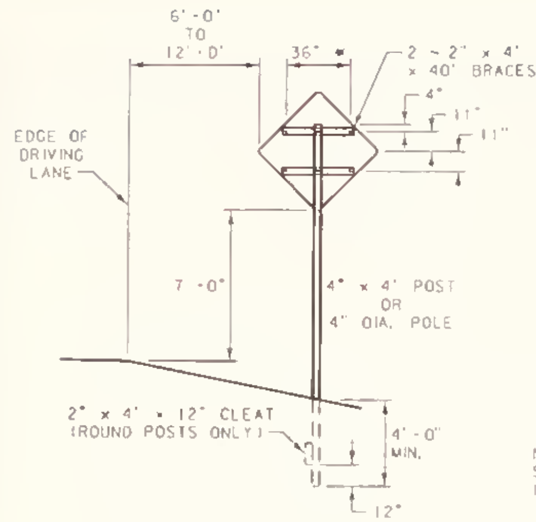
SEE THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD) PART VI FOR ADDITIONAL INFORMATION.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 618
DWG. NO.
618-00

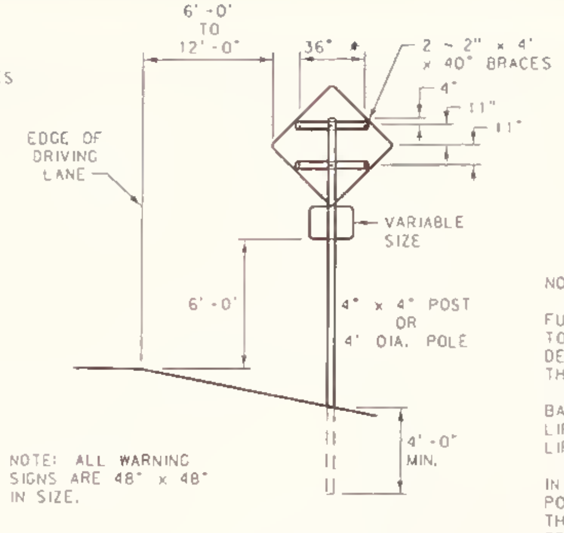
BARRICADES AND
CHANNELIZING DEVICES

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT
OF TRANSPORTATION
MONTANA CADD



WARNING



WARNING
WITH SUPPLEMENTAL PANEL

NOTES:

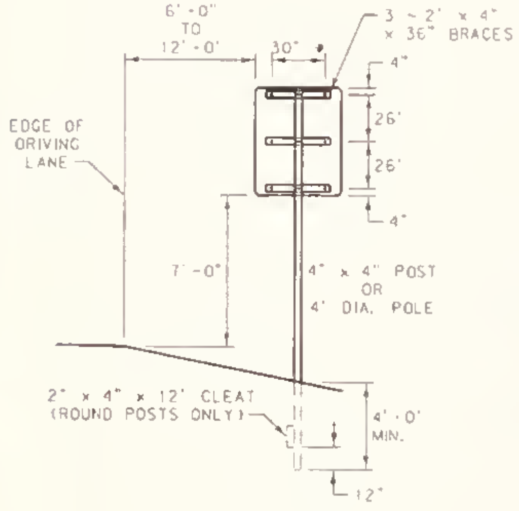
FURNISH POST OR POLE LENGTHS TO ACCOMMODATE THE FOUNDATION DEPTH, THE MOUNTING HEIGHT AND THE MOUNTINGS.

BACKFILL FOUNDATION HOLES IN 8" LIFTS, THOROUGHLY TAMPING EACH LIFT.

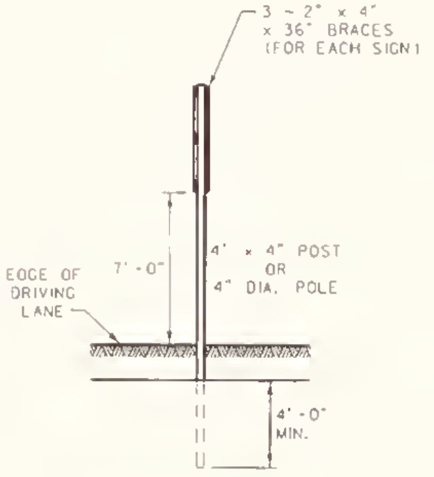
IN HIGH WIND AREAS INSTALL LARGER POSTS OR POLES COMPLYING WITH THE FOUNDATION AND BREAKAWAY REQUIREMENTS OF DTL. DWG. NO. 619-20.

* DIMENSIONS ARE FROM ℄ BOLT TO ℄ BOLT.

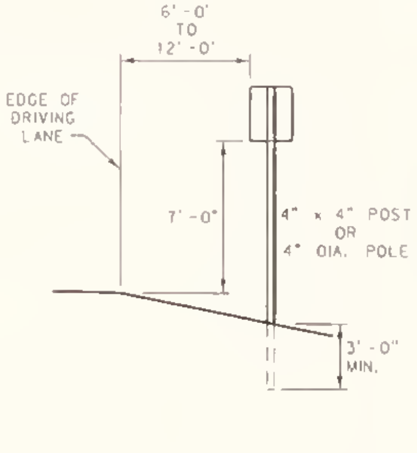
VERTICAL ALIGNMENT OF SIGNS TO BE WITHIN 5' OF PLUMB (1' IN 1').



REGULATORY
48" x 60' PANEL

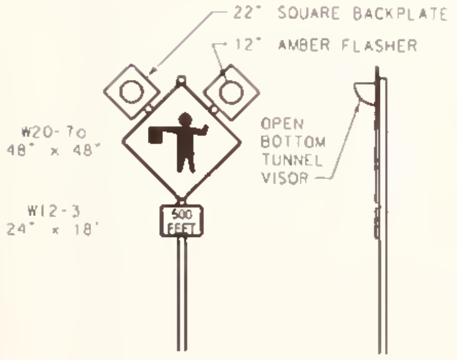


REGULATORY
48" x 60" PANEL
BACK TO BACK

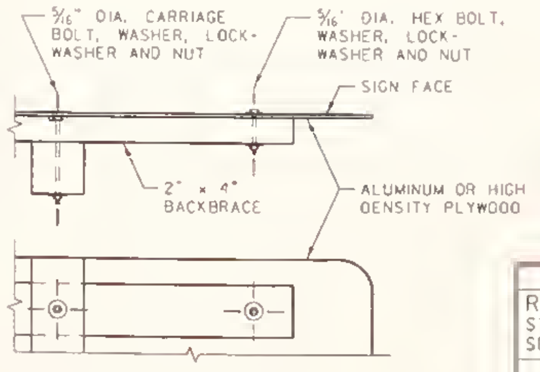


REGULATORY
24" x 30" PANEL

TYPICAL SIGN MOUNTINGS
(FOR CONSTRUCTION SIGNING ONLY)



FLASHING FLAGGER AHEAD SIGN



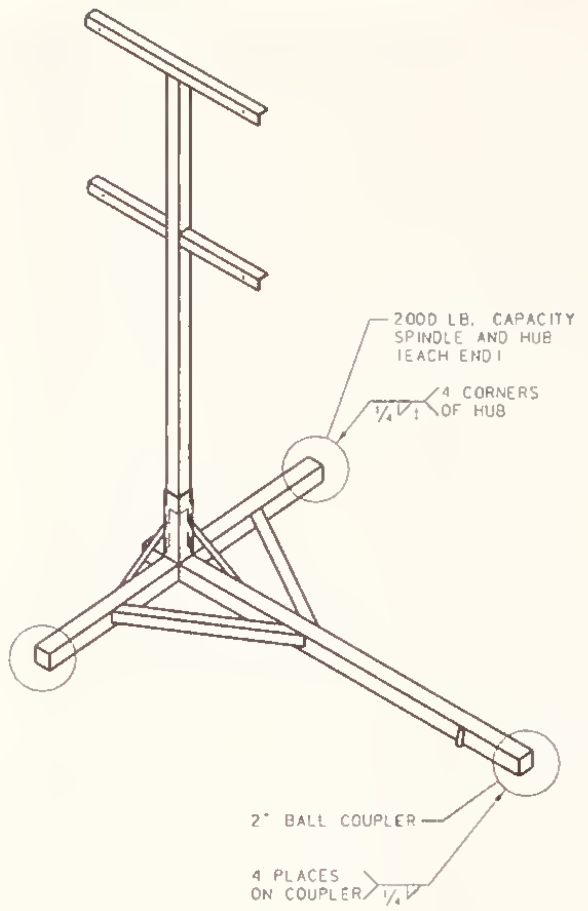
SIGN FASTENING DETAILS

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 618
DWG. NO.
618-01

CONSTRUCTION SIGN
DETAILS

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT
OF TRANSPORTATION
MONTANA
CADD

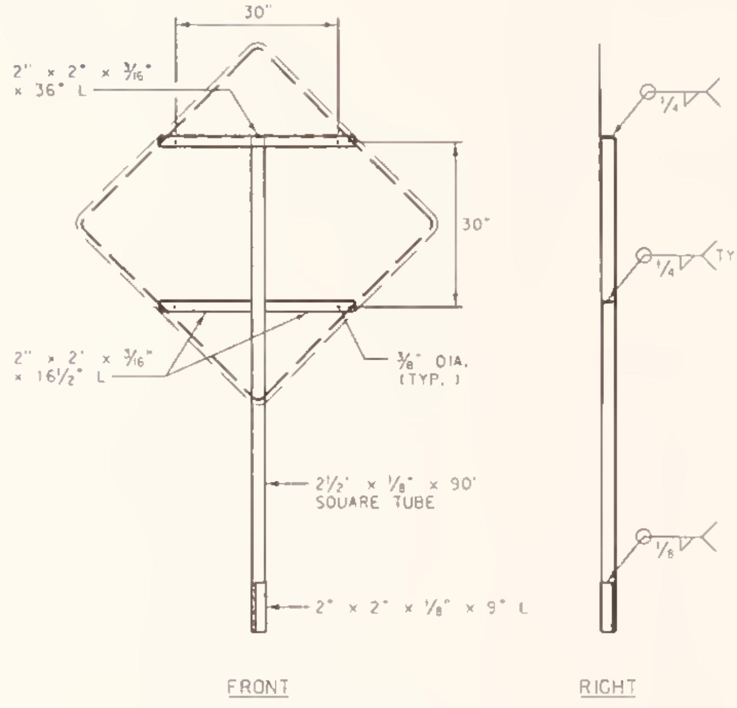


NOTES:

THE MAXIMUM WEIGHT OF THE ASSEMBLY IS 250 POUNDS.

USE A 14" WHEEL AND TIRE.

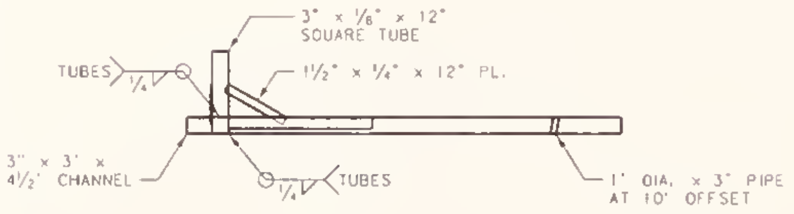
AUTOMOTIVE AND EQUIPMENT AXLE ASSEMBLIES MAY NOT BE USED FOR TRAILER-MOUNTED SIGN SUPPORTS.


30"
2" x 2" x $\frac{3}{16}$"
x 36" L
30"
2" x 2' x $\frac{3}{16}$"
x 16$\frac{1}{2}$" L
$\frac{3}{8}$" DIA.
(TYP.)
2$\frac{1}{2}$' x $\frac{1}{8}$" x 90'
SQUARE TUBE
2" x 2" x $\frac{1}{8}$" x 9" L
$\frac{1}{4}$
$\frac{1}{4}$
TYP.
$\frac{1}{8}$

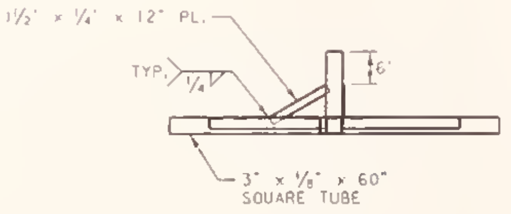
FRONT

RIGHT

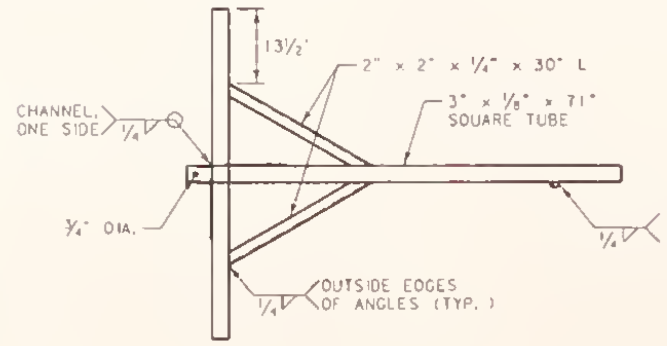
SIGN SUPPORT



FRONT


1$\frac{1}{2}$' x $\frac{1}{4}$' x 12" PL.
TYP.
$\frac{1}{4}$
6'
3" x $\frac{1}{8}$" x 60"
SQUARE TUBE

RIGHT



TOP

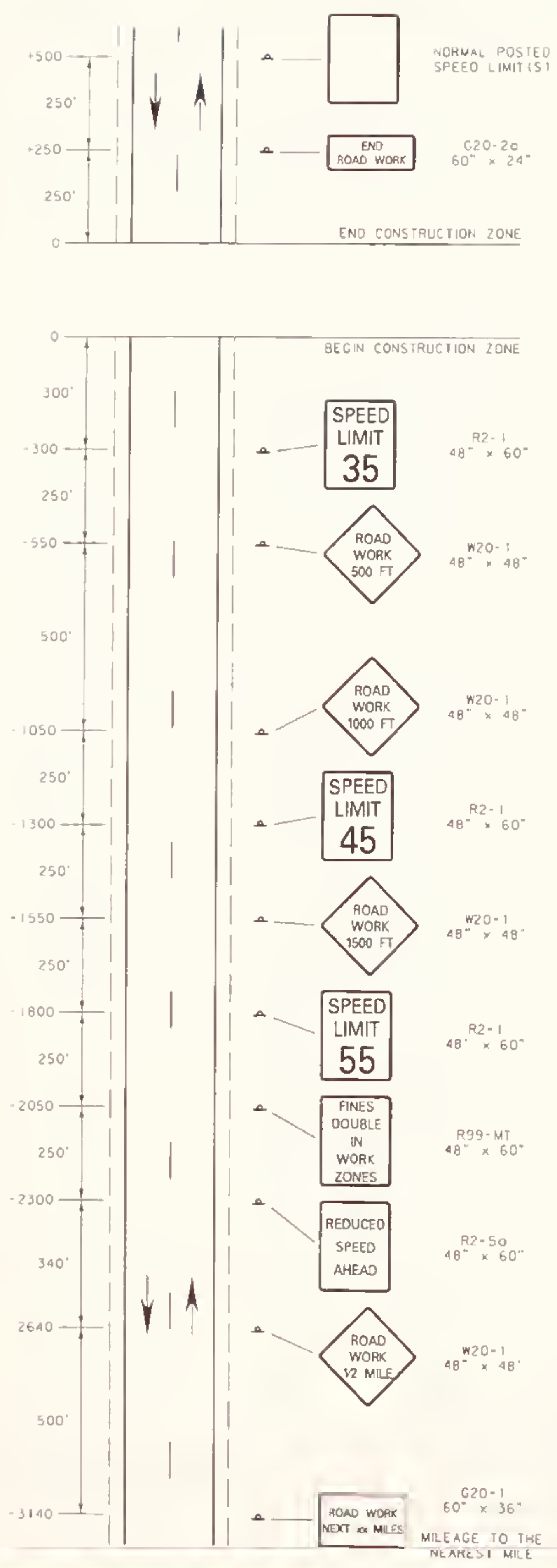
TRAILER

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 618, 715
DWG. NO.
618-02

PORTABLE SIGN
SUPPORT ASSEMBLY

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT
OF TRANSPORTATION
MONTANA
CADD



NOTES:

THIS SIGN LAYOUT IS INTENDED TO BE A PERMANENT INSTALLATION FOR THE DURATION OF THE PROJECT, AS APPROVED BY THE ENGINEER. OMIT OR COVER SIGNS WHEN NOT IN USE, INCLUDING SPEED LIMIT SIGNS NOT WARRANTED.

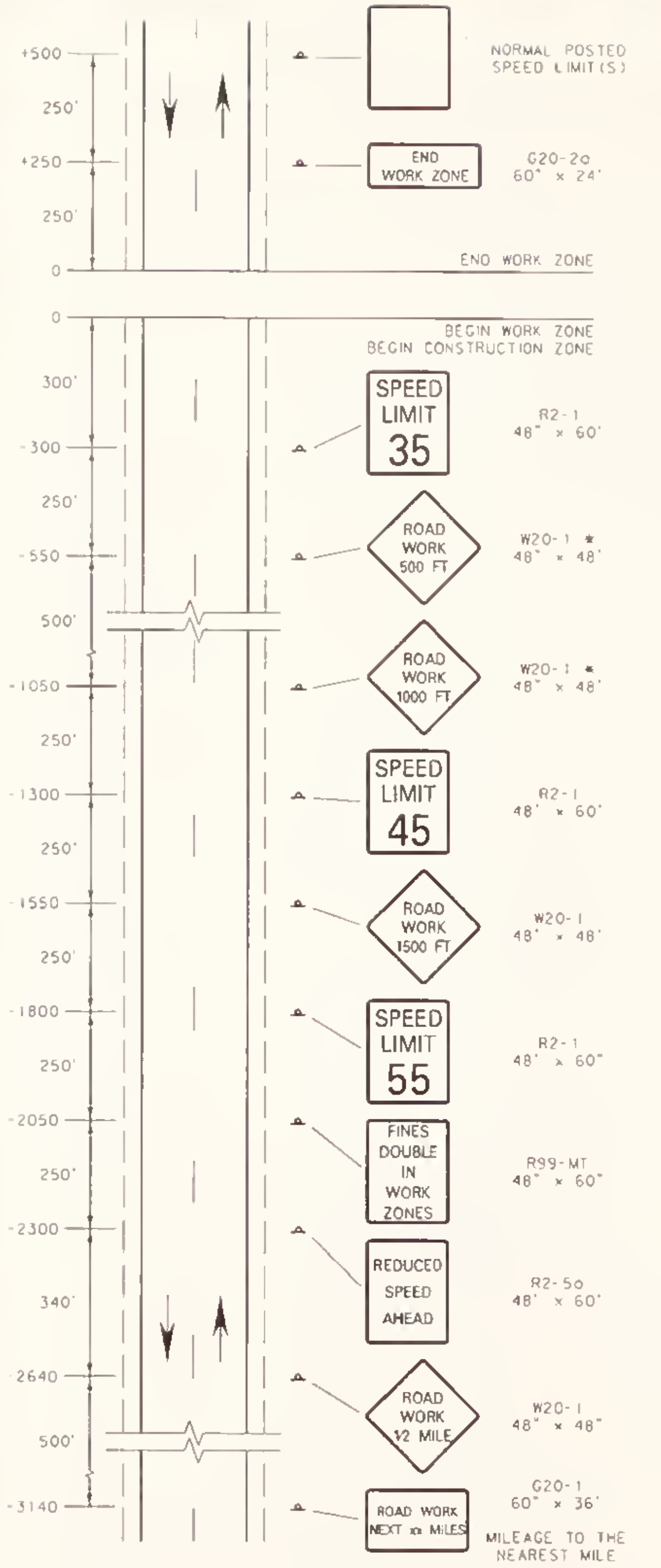
INCLUDE REGULATORY SIGNING ONLY IF THE CONSTRUCTION ZONE CONTAINS A WORK ZONE OR HAS ROADWAY CONDITIONS THAT WARRANT SPEED RESTRICTIONS. MODIFY REGULATORY SIGNS TO MATCH ADJACENT REGULATIONS.

OMIT THE G20-1 SIGN ON PROJECTS LESS THAN TWO MILES IN LENGTH.

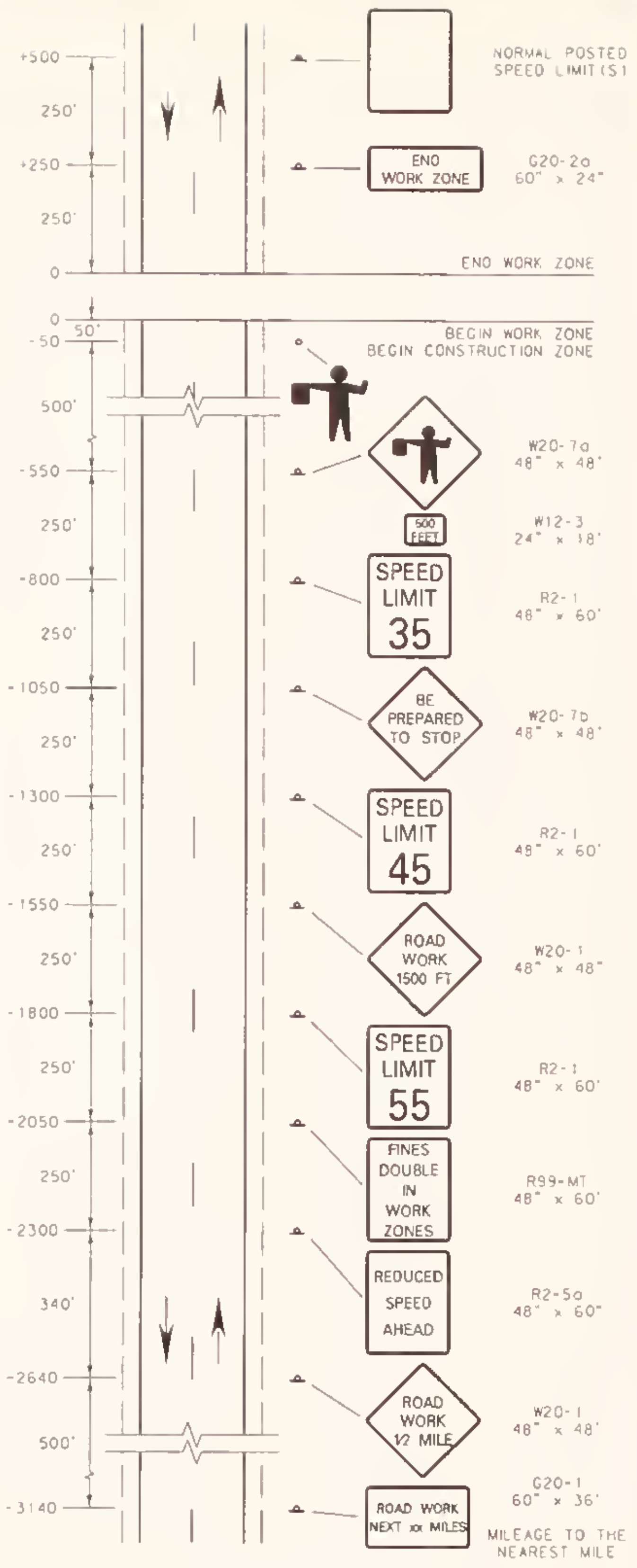
SET UP THIS SIGN LAYOUT IN EACH TRAFFIC DIRECTION.

THE CONSTRUCTION ZONE REFERS TO THE GENERAL AREA THAT REQUIRES TEMPORARY WORK ZONE TRAFFIC CONTROL.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 618
DWG. NO.
618-04
TWO-LANE
PROJECT
CONSTRUCTION ZONE
EFFECTIVE: AUGUST 1999
MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



WORK ZONE WITH NO FLAGGER



WORK ZONE WITH FLAGGER

NOTES:

THESE SIGN LAYOUTS WORK IN CONJUNCTION WITH THE PERMANENT LAYOUT ILLUSTRATED ON DTL. DWG. NO. 618-04. COVER OR OMIT SIGNS WHEN NOT IN USE, INCLUDING SPEED LIMIT SIGNS NOT WARRANTED.

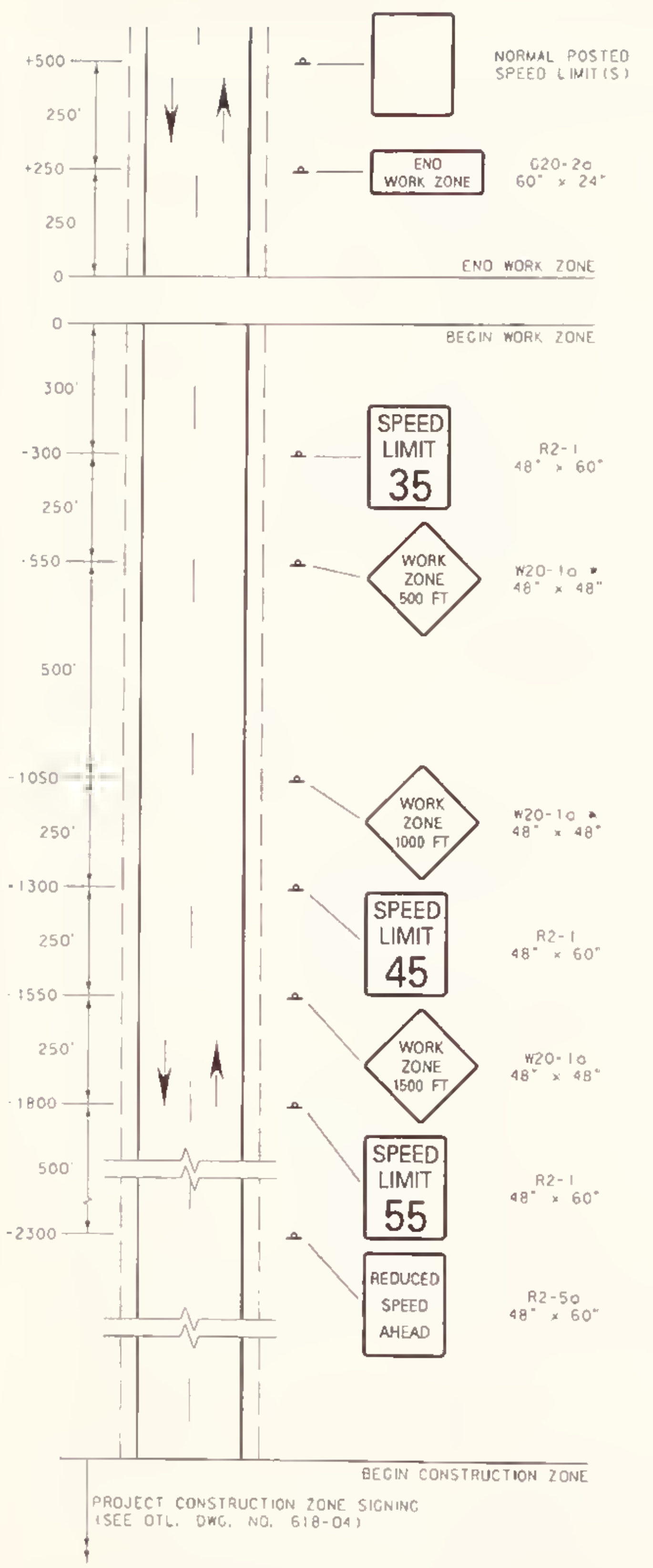
INCLUDE REGULATORY SIGNING ONLY IF THERE IS REASON TO RESTRICT SPEED WITHIN THE WORK ZONE. MODIFY REGULATORY SIGNS TO MATCH ADJACENT REGULATIONS.

SEE DTL. DWG. NO. 618-08 "TWO-LANE WORK ZONES WITHIN PROJECT LIMITS" FOR SIGNING THE OPPOSING TRAFFIC DIRECTION.

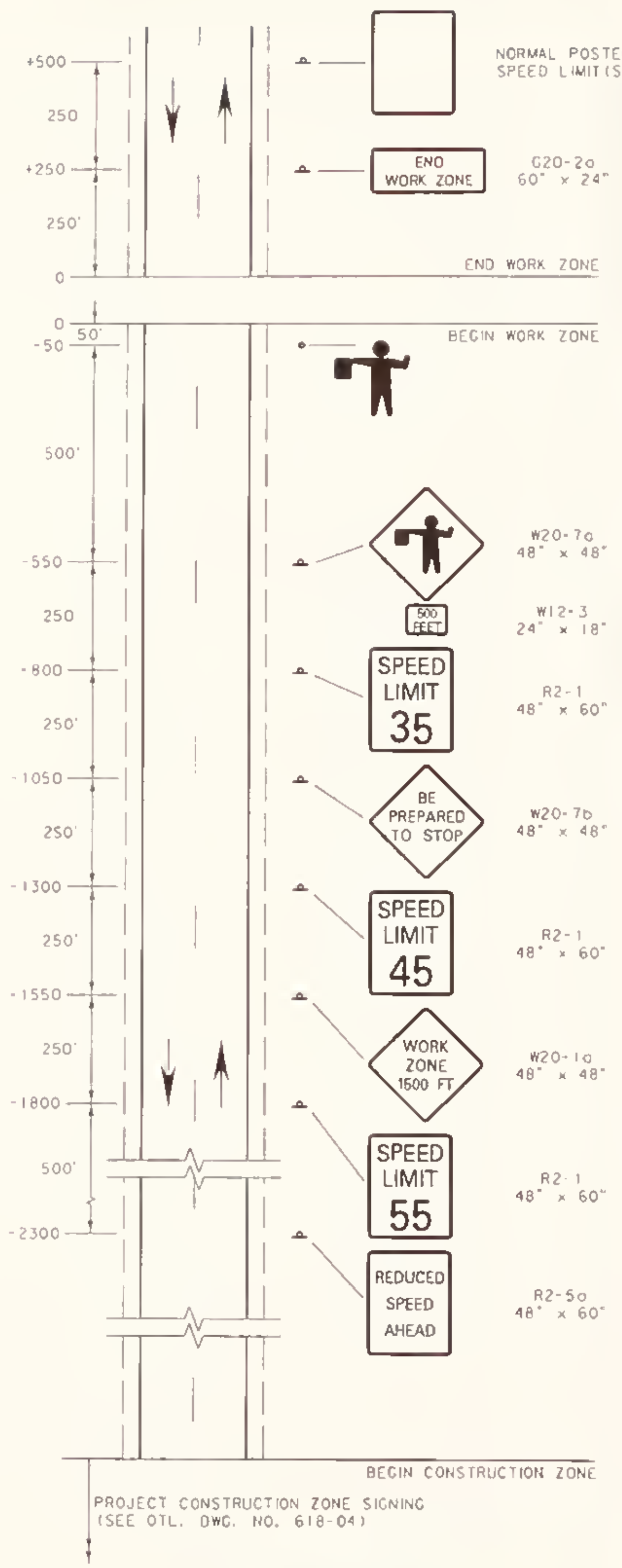
THE WORK ZONE REFERS TO THE AREA WITHIN THE CONSTRUCTION ZONE WHERE WORK IS ACTUALLY TAKING PLACE.

* USE MORE SPECIFIC SIGNS, WHERE APPLICABLE, SUCH AS W8-3 "PAVEMENT ENDS."

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 618
DWG. NO.
618-06
TWO-LANE
WORK ZONES
AT PROJECT LIMIT
EFFECTIVE: AUGUST 1999
MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



WORK ZONE WITH NO FLAGGER



WORK ZONE WITH FLAGGER

NOTES:

INCLUDE REGULATORY SIGNING ONLY IF THERE IS REASON TO RESTRICT SPEED WITHIN THE WORK ZONE. MODIFY REGULATORY SIGNS TO MATCH ADJACENT REGULATIONS.

SET UP THIS SIGN LAYOUT IN EACH TRAFFIC DIRECTION. DO NOT LOCATE THESE SIGN LAYOUTS WITHIN TWO MILES OF ANOTHER LAYOUT.

THE WORK ZONE REFERS TO THE AREA WITHIN THE CONSTRUCTION ZONE WHERE WORK IS ACTUALLY TAKING PLACE.

* USE MORE SPECIFIC SIGNS, WHERE APPLICABLE, SUCH AS W8-3 "PAVEMENT ENDS."

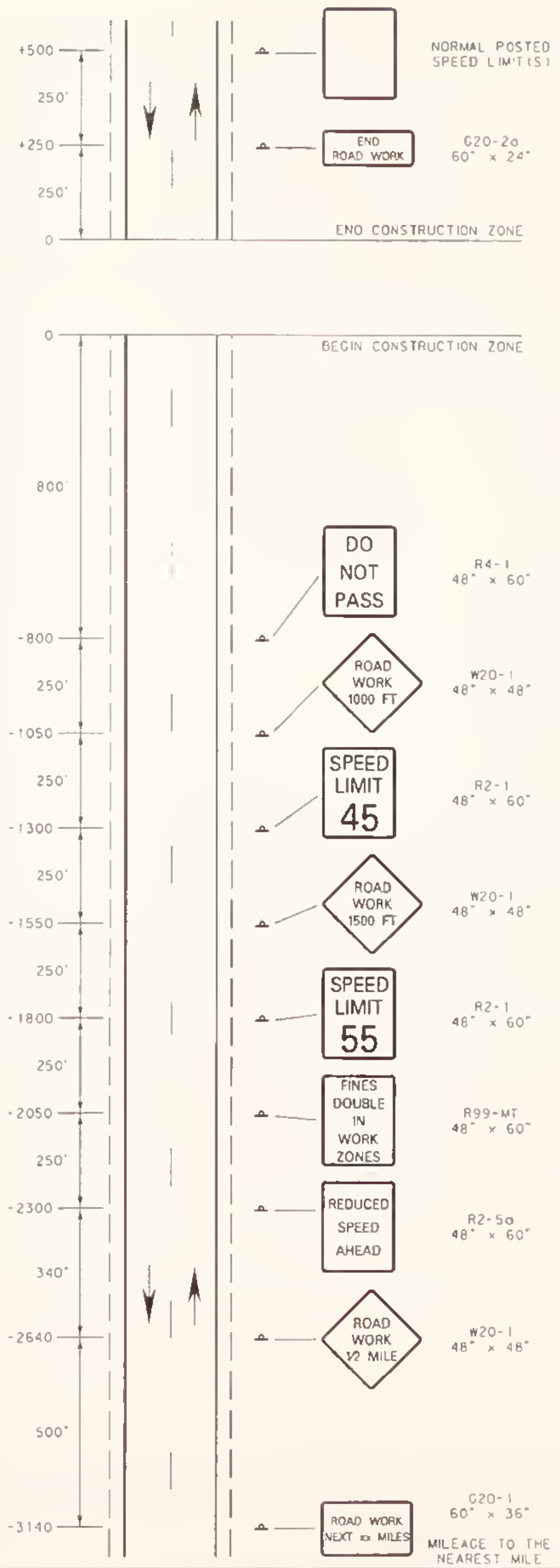
DETAILED DRAWING

REFERENCE	DWG. NO.
STANDARD SPEC. SECTION 618	618-08

TWO-LANE
WORK ZONES
WITHIN PROJECT LIMITS

EFFECTIVE: AUGUST 1999

MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



NOTES:

THIS SIGN LAYOUT WORKS IN CONJUNCTION WITH THE PERMANENT LAYOUT ILLUSTRATED ON DTL. DWG. NO. 618-04. COVER OR OMIT SIGNS WHEN NOT IN USE, INCLUDING SPEED LIMIT SIGNS NOT WARRANTED.

INCLUDE REGULATORY SIGNING ONLY IF THERE IS REASON TO RESTRICT SPEED WITHIN THE CONSTRUCTION ZONE. MODIFY REGULATORY SIGNS TO MATCH ADJACENT REGULATIONS.

OMIT THE G20-1 SIGN ON PROJECTS LESS THAN TWO MILES IN LENGTH.

SET UP THIS SIGN LAYOUT IN EACH TRAFFIC DIRECTION.

THE CONSTRUCTION ZONE REFERS TO THE GENERAL AREA THAT REQUIRES TEMPORARY WORK ZONE TRAFFIC CONTROL.

FOR SEAL COAT WORK ZONE ACTIVITIES, USE THE FLAGGER APPLICATIONS OF THE WORK ZONE LAYOUTS FROM DTL. DWG. NO. 618-06 (AT PROJECT LIMIT) AND 618-08 (WITHIN PROJECT LIMITS).

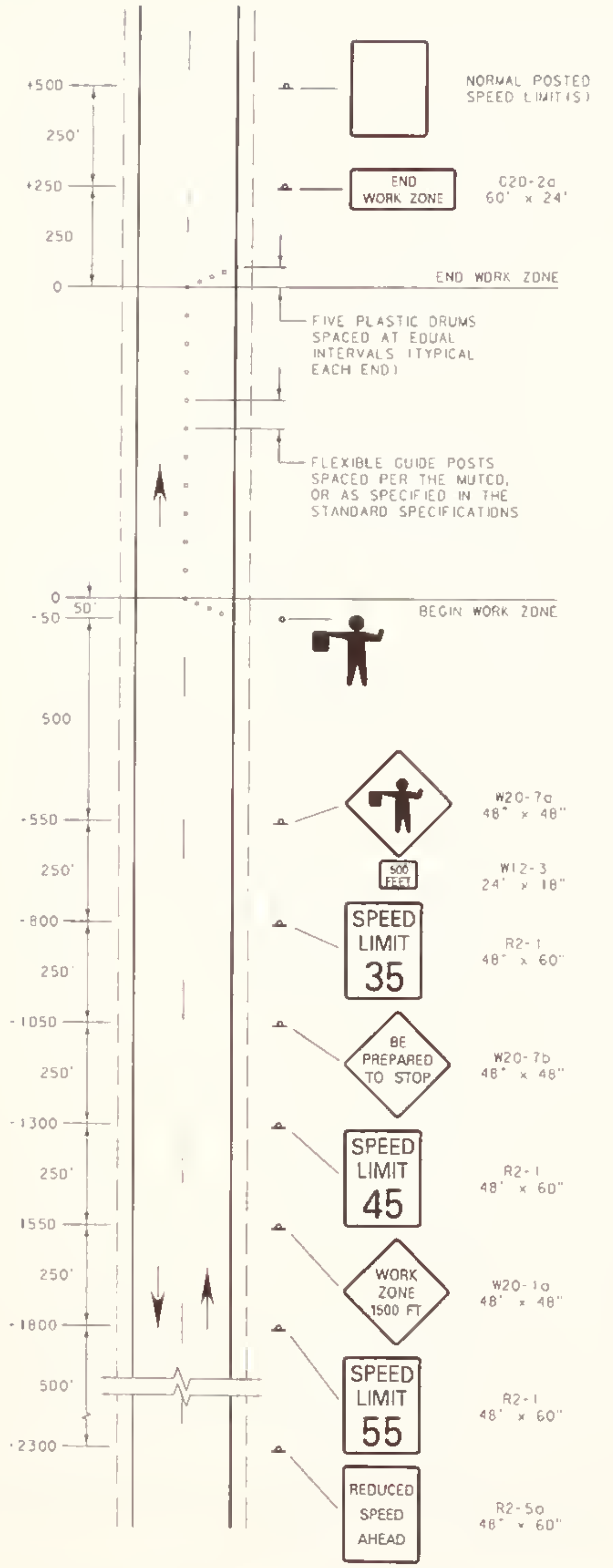
DETAILED DRAWING

REFERENCE	DWG. NO.
STANDARD SPEC. SECTION 618	618-10

TWO-LANE
SEAL COAT PROJECT
CONSTRUCTION ZONE

EFFECTIVE: AUGUST 1999

MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



NOTES:

MODIFY REGULATORY SIGNS TO MATCH ADJACENT REGULATIONS

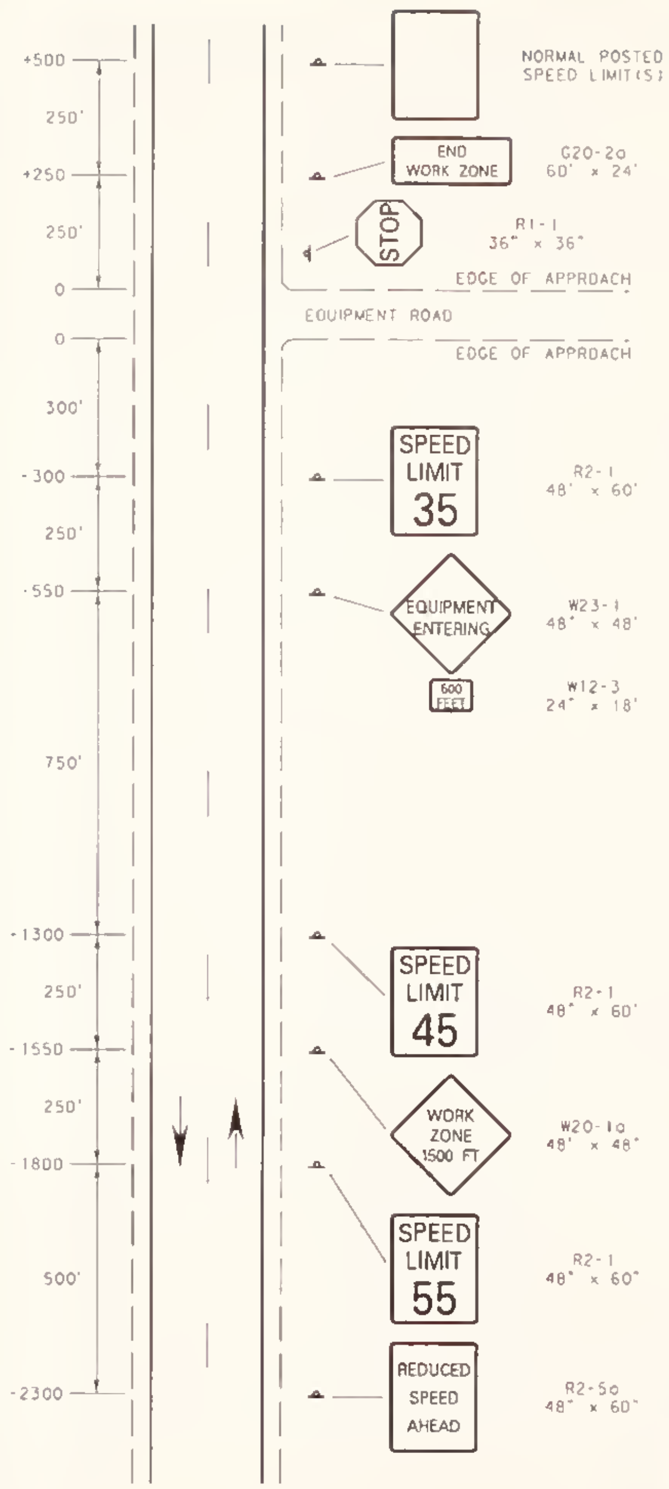
SET UP THIS SIGN LAYOUT IN EACH TRAFFIC DIRECTION.

THE WORK ZONE REFERS TO THE AREA WITHIN THE CONSTRUCTION ZONE WHERE WORK IS ACTUALLY TAKING PLACE.

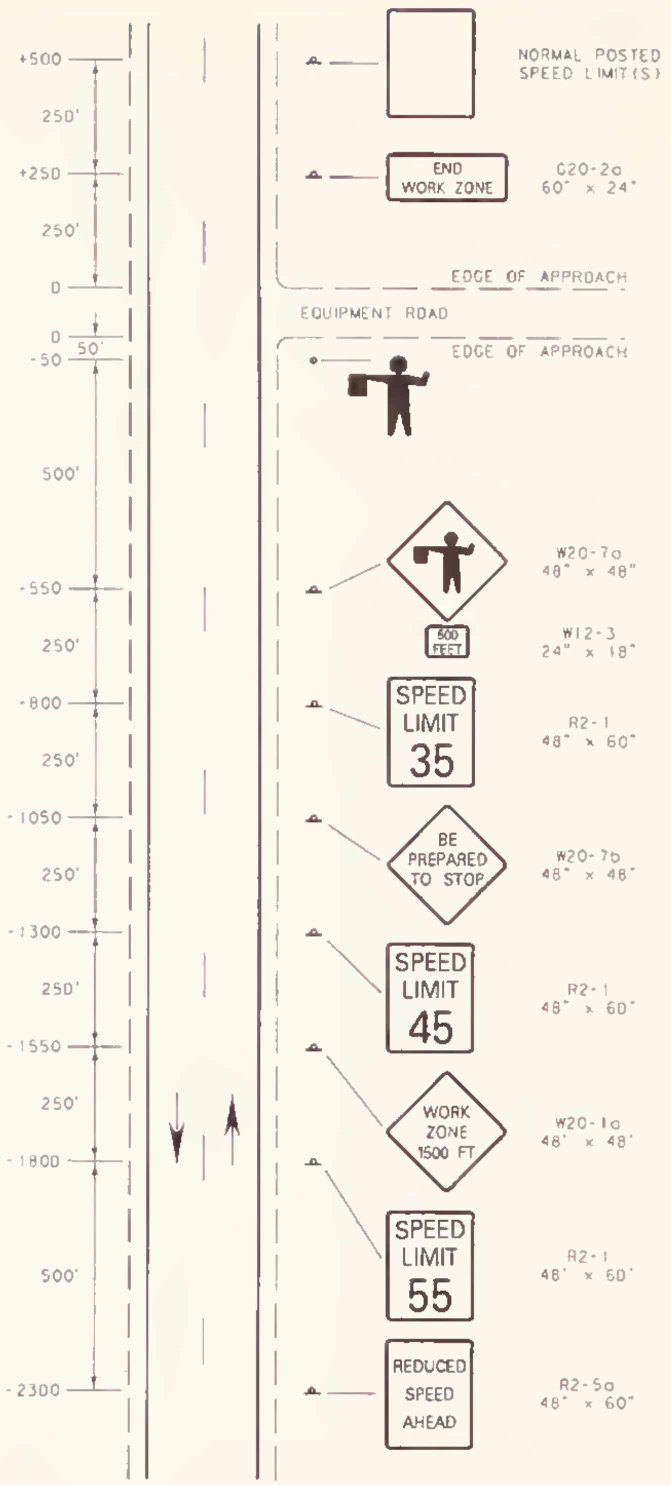
DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 618
DWG. NO.
618-12

TWO-LANE
LANE CLOSURE

EFFECTIVE: AUGUST 1999
MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



EQUIPMENT ENTRANCE WITH NO FLAGGER



EQUIPMENT ENTRANCE WITH FLAGGER

NOTES:

INCLUDE REGULATORY SIGNING ONLY IF THERE IS REASON TO RESTRICT SPEED. MODIFY REGULATORY SIGNS TO MATCH ADJACENT REGULATIONS.

SET UP THIS SIGN LAYOUT IN EACH TRAFFIC DIRECTION, AS NEEDED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 618
DWG. NO.
618-14

TWO-LANE
EQUIPMENT ENTRANCES
WITHIN PROJECT LIMITS

EFFECTIVE: AUGUST 1999
MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

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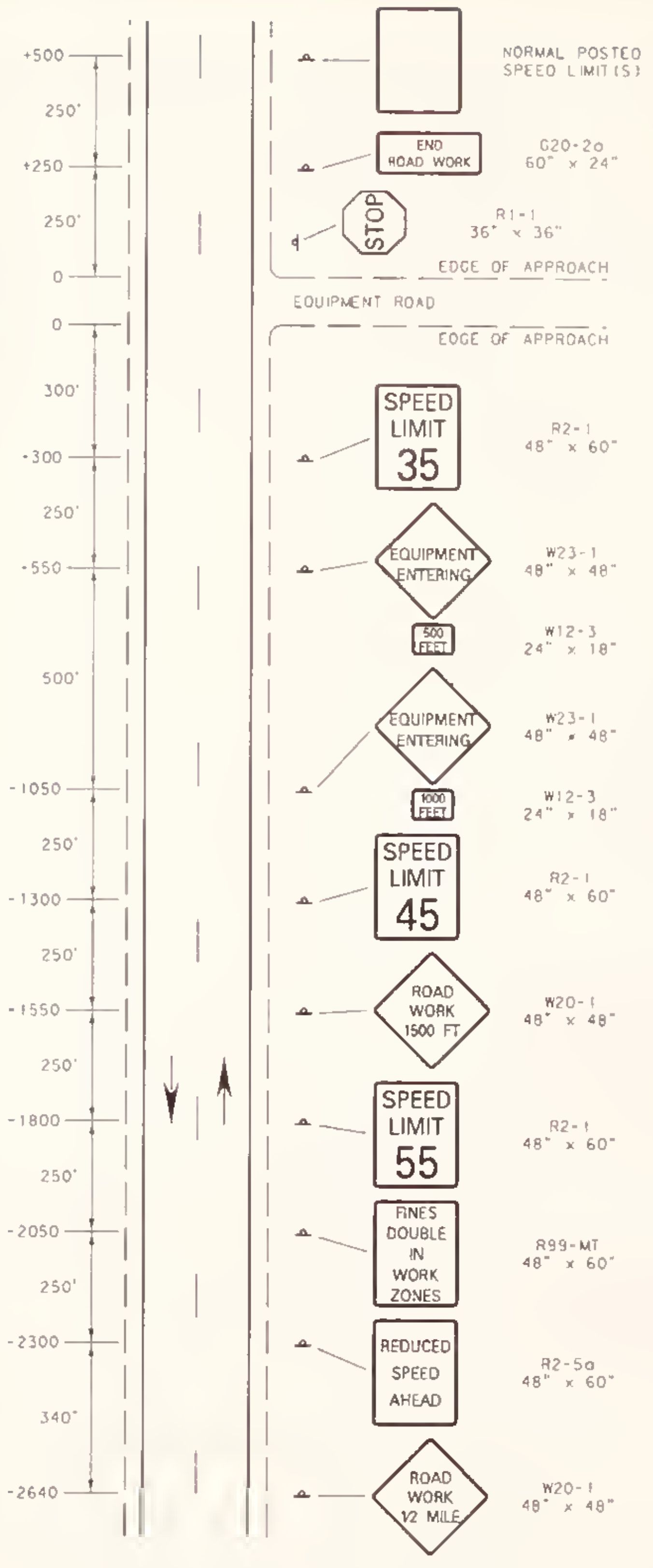
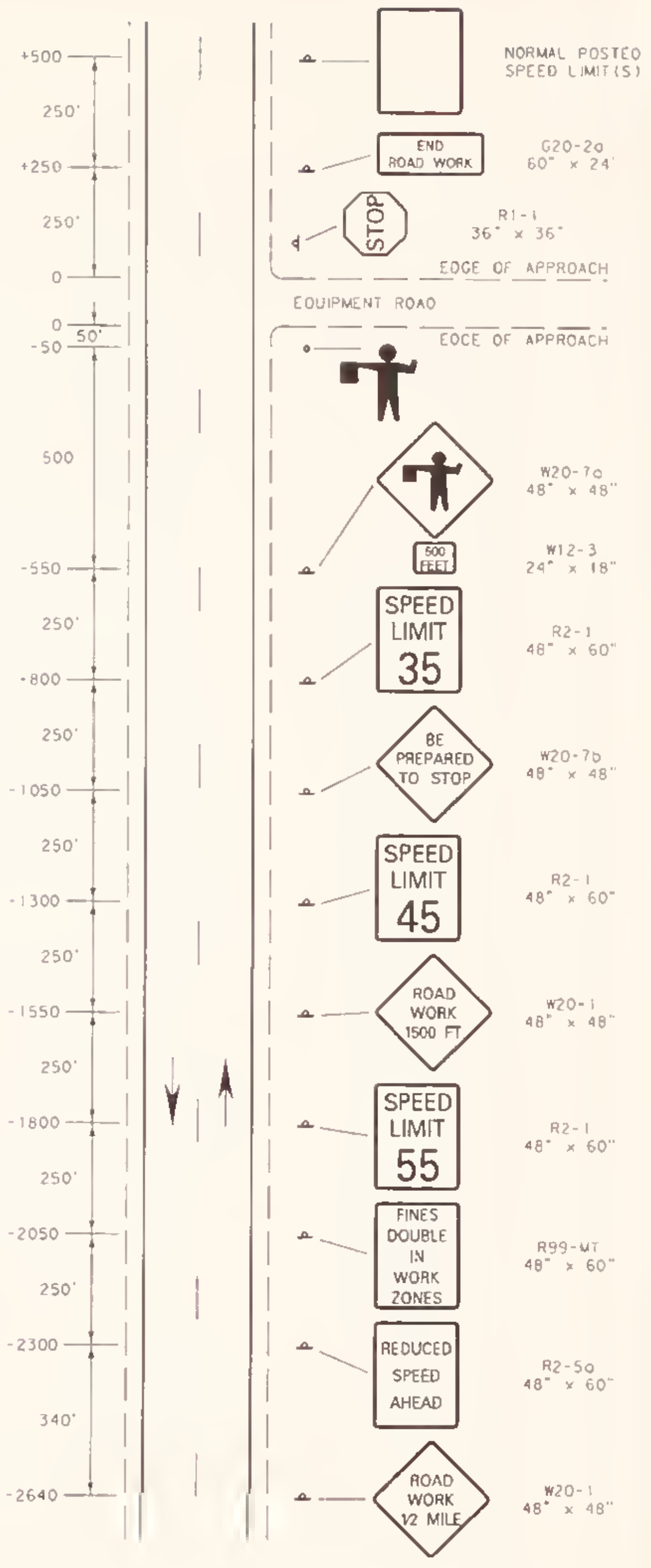


EQUIPMENT ENTRANCE WITH NO FLAGGER



EQUIPMENT ENTRANCE WITH FLAGGER

NOTES:

INCLUDE REGULATORY SIGNING ONLY IF THERE IS REASON TO RESTRICT SPEED. MODIFY REGULATORY SIGNS TO MATCH ADJACENT REGULATIONS.

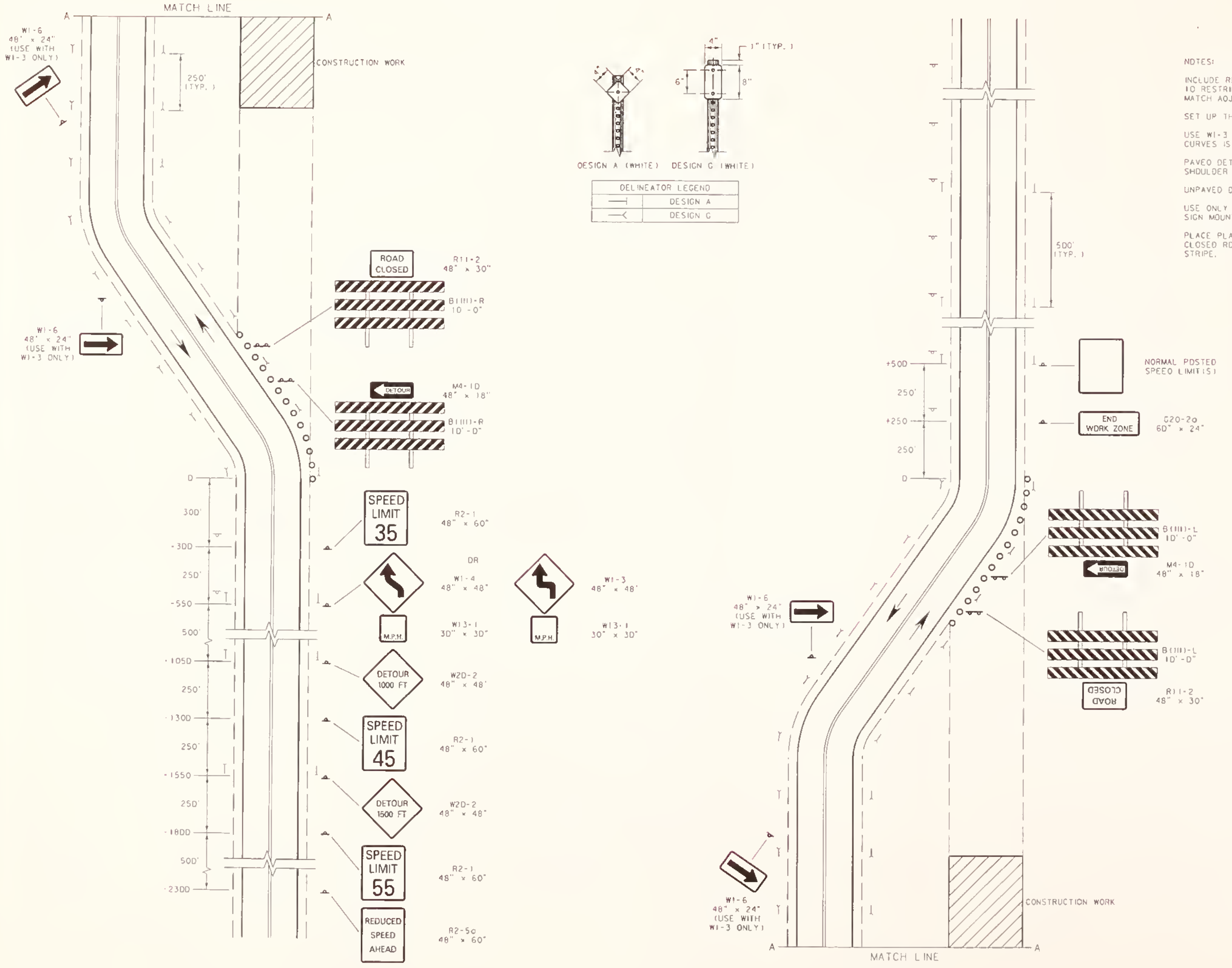
SET UP THIS SIGN LAYOUT IN EACH TRAFFIC DIRECTION. AS NEEDED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 618
DWG. NO.
618-16

TWO-LANE
EQUIPMENT ENTRANCES
OUTSIDE PROJECT LIMITS

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



NOTES:

INCLUDE REGULATORY SIGNING ONLY IF THERE IS REASON TO RESTRICT SPEED. MODIFY REGULATORY SIGNS TO MATCH ADJACENT REGULATIONS.

SET UP THIS SIGN LAYOUT IN EACH TRAFFIC DIRECTION.

USE W1-3 SIGNS ONLY WHEN THE DESIGN SPEED OF THE CURVES IS 30 M.P.H. OR LESS.

PAVED DETOURS 24' WIDE OR GREATER HAVE 4" WHITE SHOULDER STRIPES AND APPROPRIATE CENTERLINE STRIPES.

UNPAVED DETOURS MAY REQUIRE ADDITIONAL DELINEATION.

USE ONLY POST MOUNTED SIGNS. DO NOT USE PORTABLE SIGN MOUNTS.

PLACE PLASTIC DRUMS AT 5 FOOT INTERVALS ON THE CLOSED ROADWAY, ADJACENT TO THE DETOUR SHOULDER STRIPE.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 618
DWG. NO.
618-18

TWO-LANE
DETOUR

EFFECTIVE: AUGUST 1999
MONTANA DEPARTMENT
OF TRANSPORTATION
MONTANA
CADD

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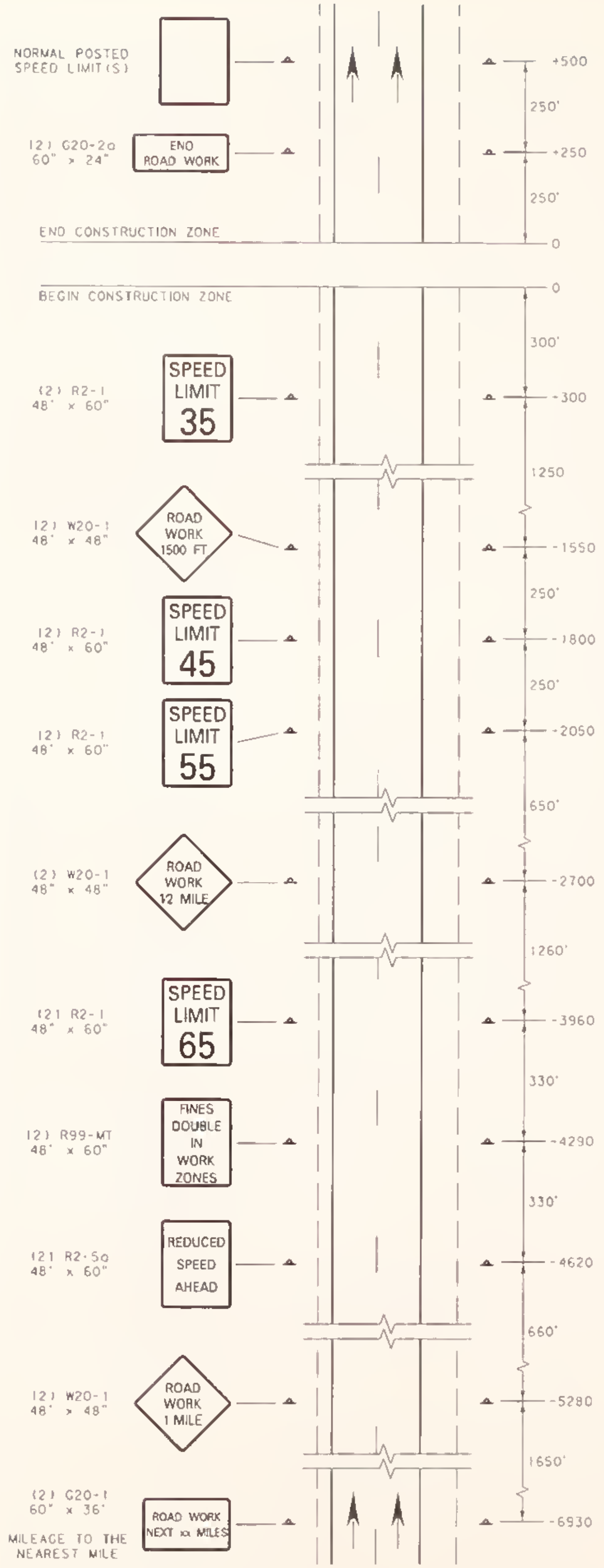


NOTES:

THIS SIGN LAYOUT IS INTENDED TO BE A PERMANENT INSTALLATION FOR THE DURATION OF THE PROJECT, AS APPROVED BY THE ENGINEER. OMIT OR COVER SIGNS WHEN NOT IN USE, INCLUDING SPEED LIMIT SIGNS NOT WARRANTED.

INCLUDE REGULATORY SIGNING ONLY IF THE CONSTRUCTION ZONE CONTAINS A WORK ZONE OR HAS ROADWAY CONDITIONS THAT WARRANT SPEED RESTRICTIONS. MODIFY REGULATORY SIGNS TO MATCH ADJACENT REGULATIONS.

OMIT THE G20-1 SIGN ON PROJECTS LESS THAN TWO MILES IN LENGTH.

SET UP THIS SIGN LAYOUT IN EACH TRAFFIC DIRECTION.

THE CONSTRUCTION ZONE REFERS TO THE GENERAL AREA THAT REQUIRES TEMPORARY WORK ZONE TRAFFIC CONTROL.

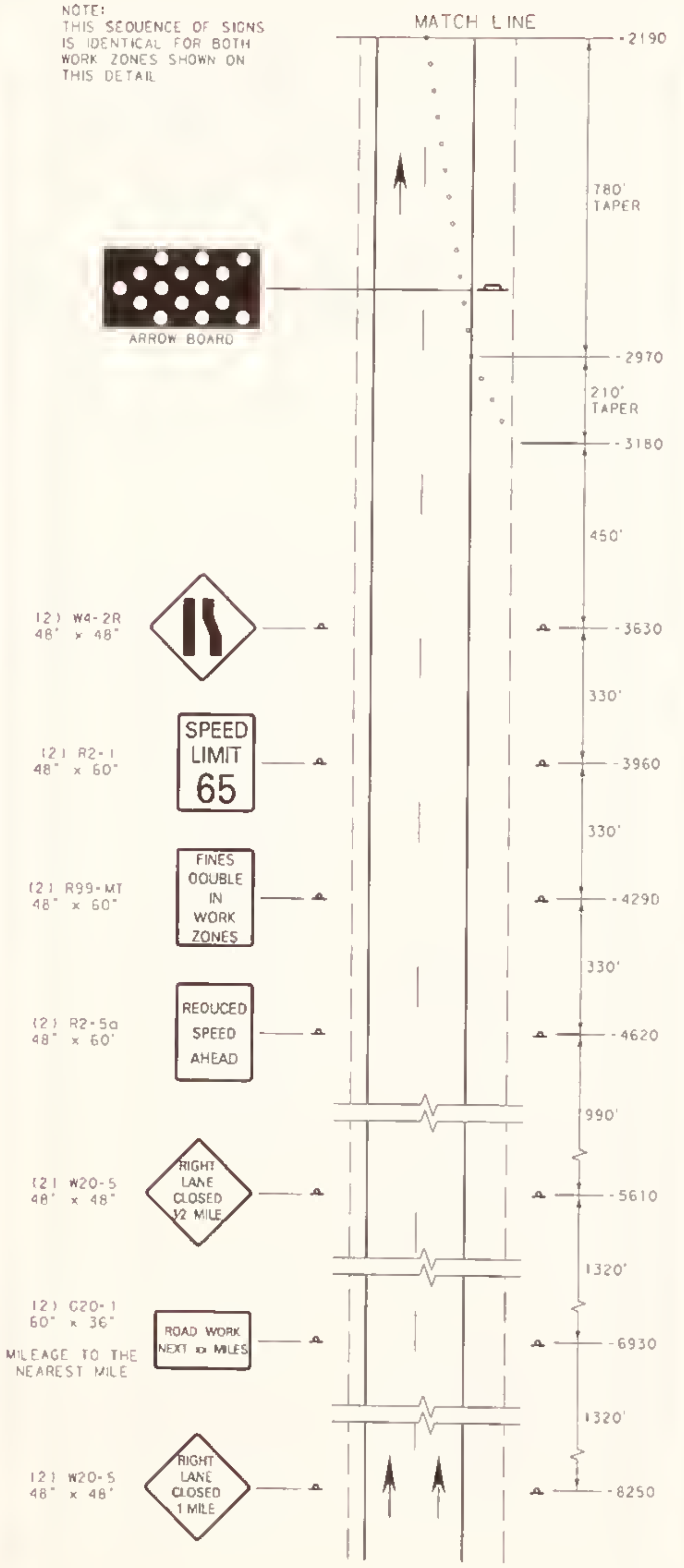
DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 618
DWG. NO.
618-20

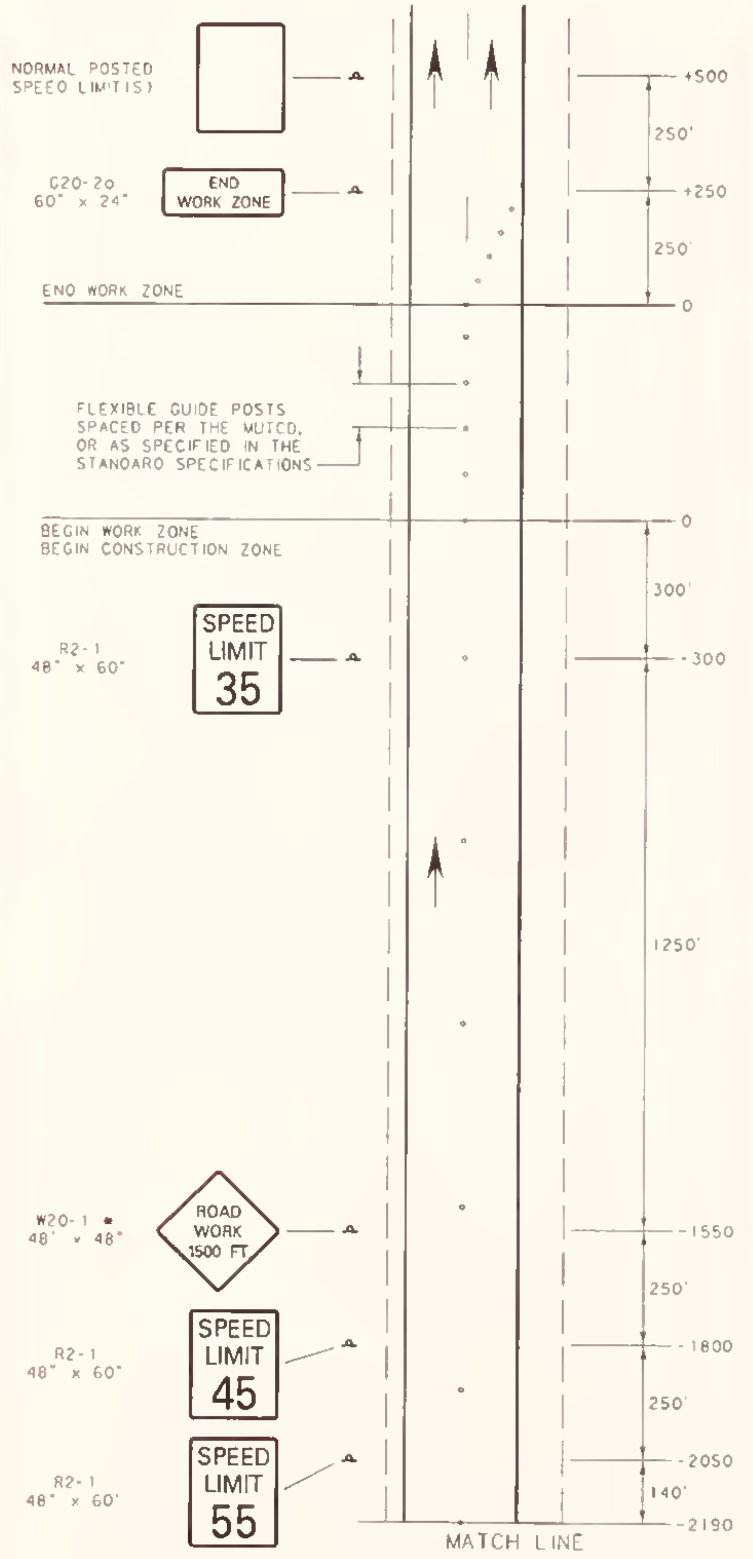
FOUR-LANE
PROJECT
CONSTRUCTION ZONE

EFFECTIVE: AUGUST 1999

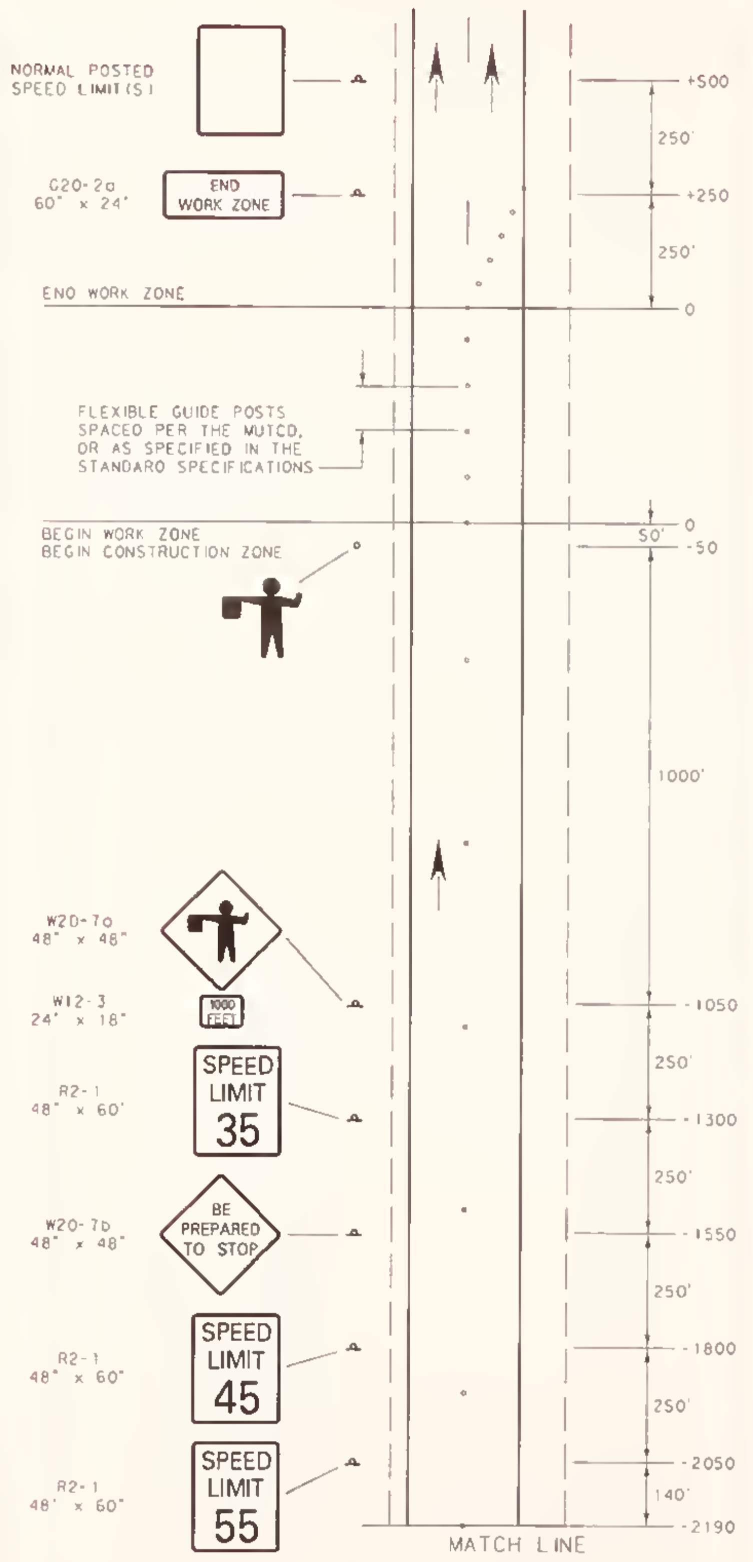
MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

NOTE:
THIS SEQUENCE OF SIGNS IS IDENTICAL FOR BOTH WORK ZONES SHOWN ON THIS DETAIL





WORK ZONE WITH NO FLAGGER



WORK ZONE WITH FLAGGER

NOTES:

THESE SIGN LAYOUTS WORK IN CONJUNCTION WITH THE PERMANENT LAYOUT ILLUSTRATED ON DTL. DWG. NO. 618-20. COVER OR OMIT SIGNS WHEN NOT IN USE. INCLUDING SPEED LIMIT SIGNS NOT WARRANTED.

INCLUDE REGULATORY SIGNING ONLY IF THERE IS REASON TO RESTRICT SPEED WITHIN THE WORK ZONE. MODIFY REGULATORY SIGNS TO MATCH ADJACENT REGULATIONS.

THE WORK ZONE REFERS TO THE AREA WITHIN THE CONSTRUCTION ZONE WHERE WORK IS ACTUALLY TAKING PLACE.

* USE MORE SPECIFIC SIGNS, WHERE APPLICABLE, SUCH AS W8-3 "PAVEMENT ENDS."

USE PLASTIC DRUMS FOR CHANNELIZATION IN ALL TRANSITION SECTIONS.

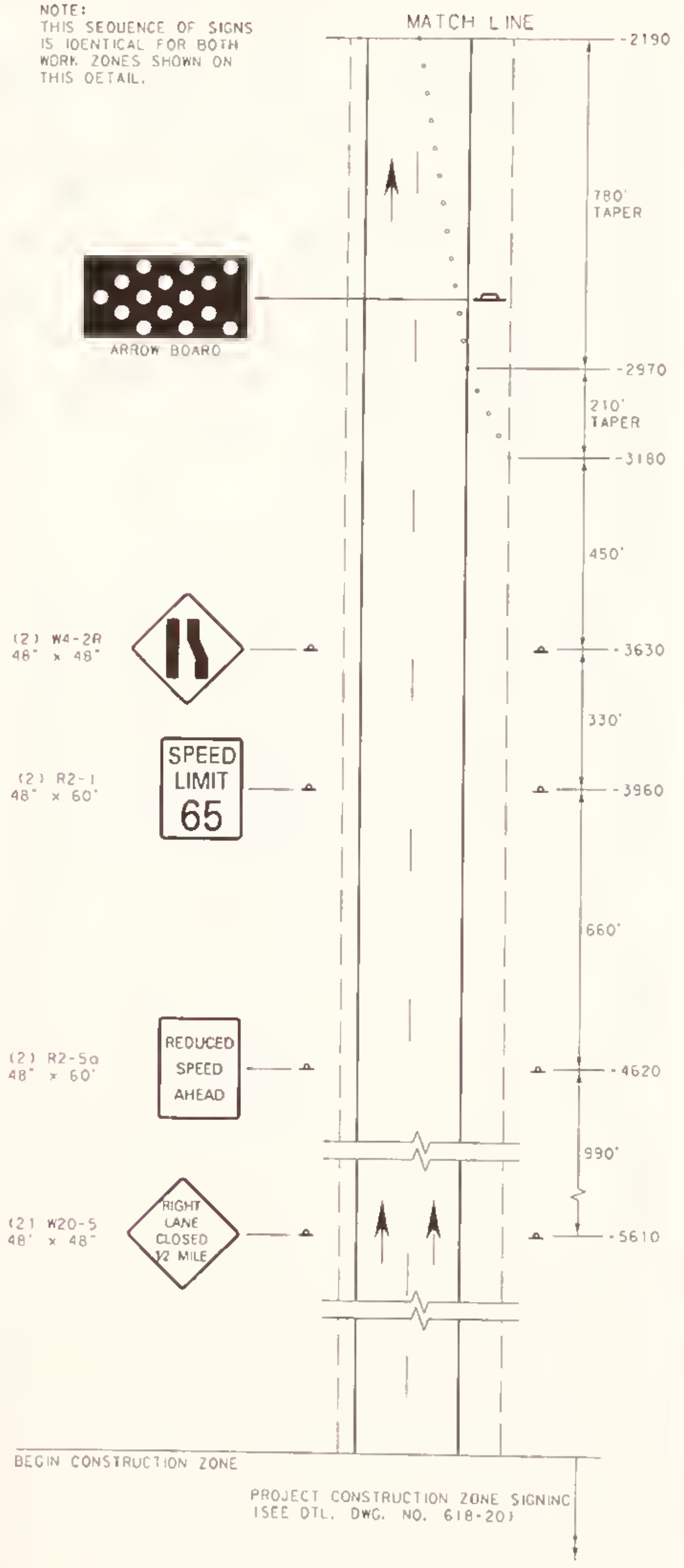
DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 618
DWG. NO.
618-22

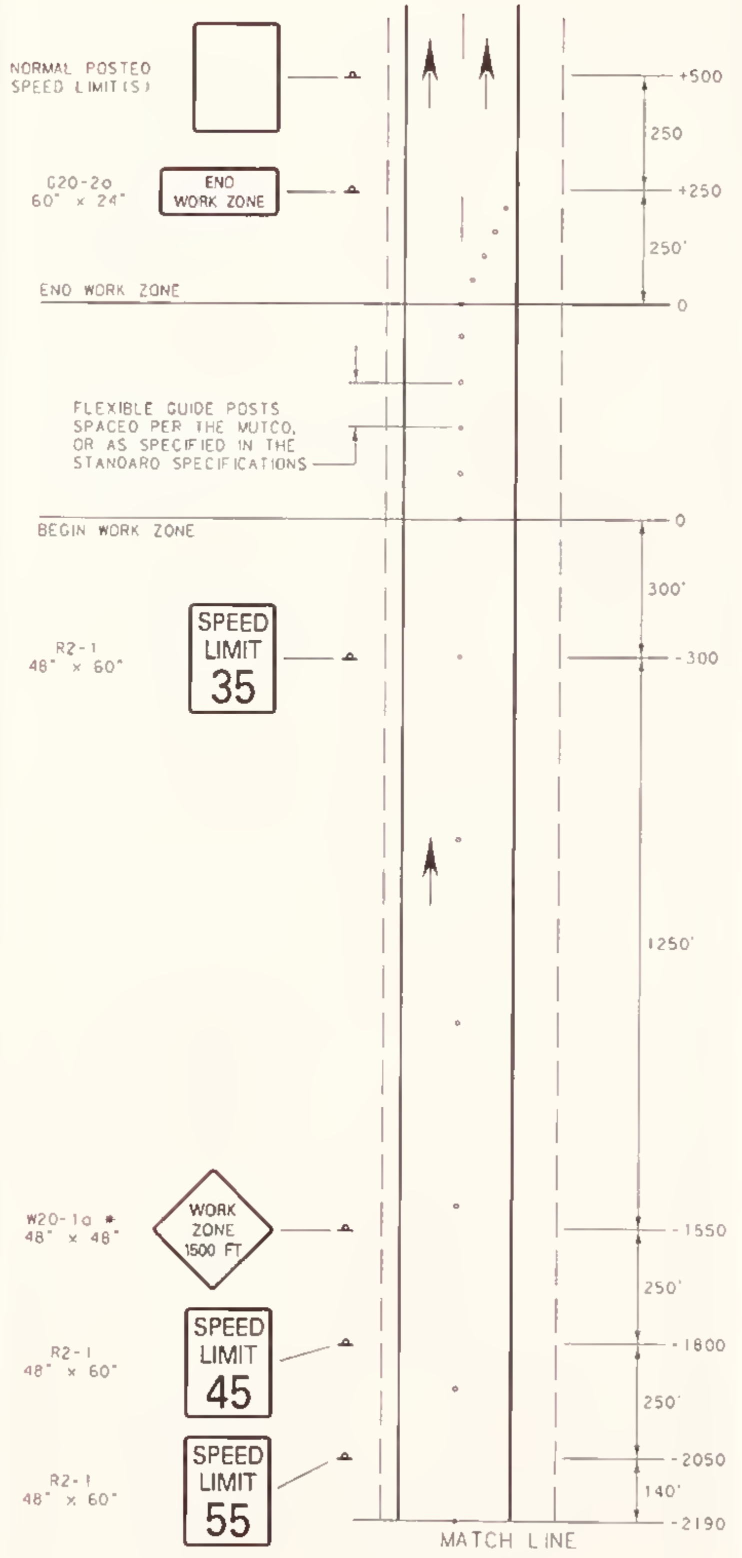
FOUR-LANE
WORK ZONES
AT PROJECT LIMIT

EFFECTIVE: AUGUST 1999

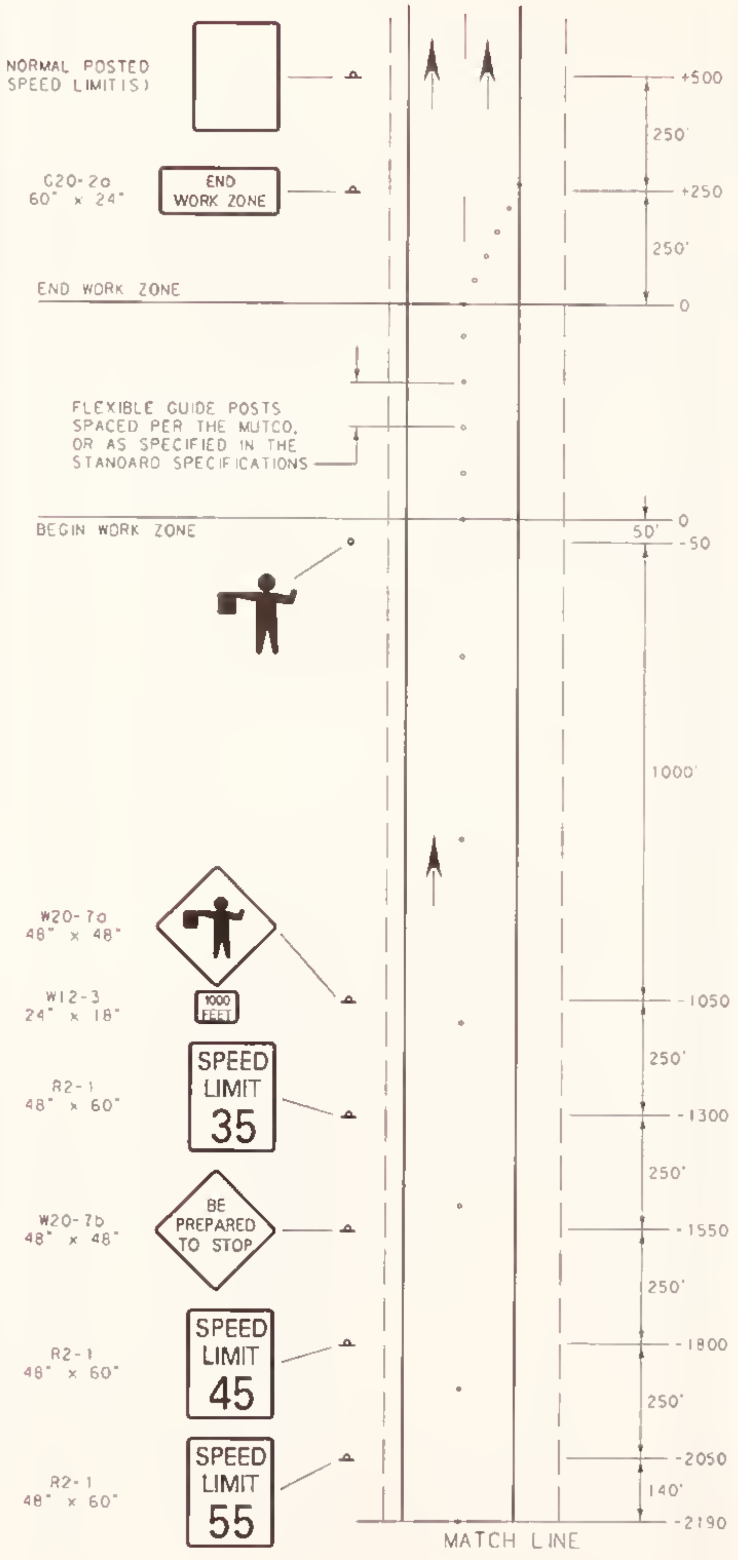
MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

NOTE:
THIS SEQUENCE OF SIGNS IS IDENTICAL FOR BOTH WORK ZONES SHOWN ON THIS DETAIL.





WORK ZONE WITH NO FLAGGER



WORK ZONE WITH FLAGGER

NOTES:

INCLUDE REGULATORY SIGNING ONLY IF THERE IS REASON TO RESTRICT SPEED WITHIN THE WORK ZONE. MODIFY REGULATORY SIGNS TO MATCH ADJACENT REGULATIONS.

THE WORK ZONE REFERS TO THE AREA WITHIN THE CONSTRUCTION ZONE WHERE WORK IS ACTUALLY TAKING PLACE.

* USE MORE SPECIFIC SIGNS, WHERE APPLICABLE, SUCH AS W8-3 "PAVEMENT ENDS."

USE PLASTIC DRUMS FOR CHANNELIZATION IN ALL TRANSITION SECTIONS.

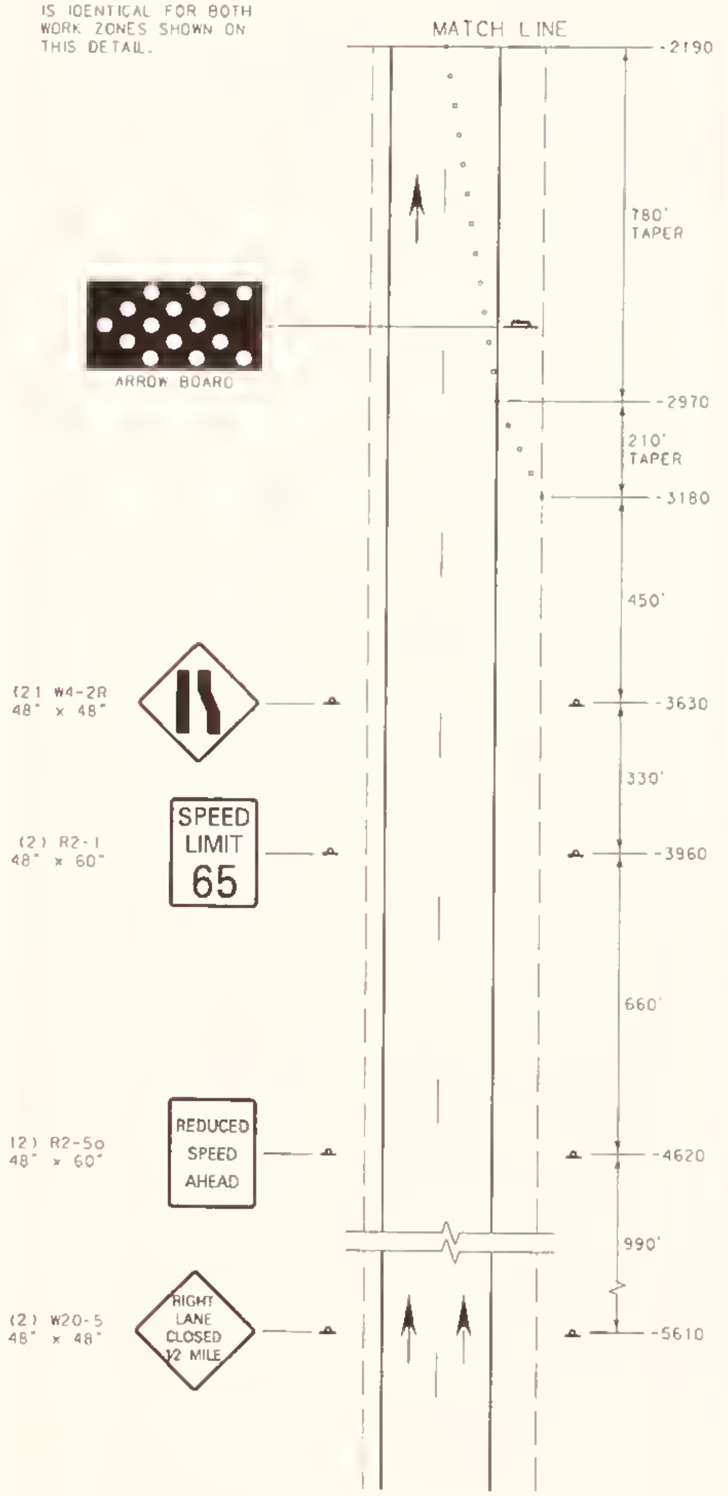
DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 618
DWG. NO.
618-24

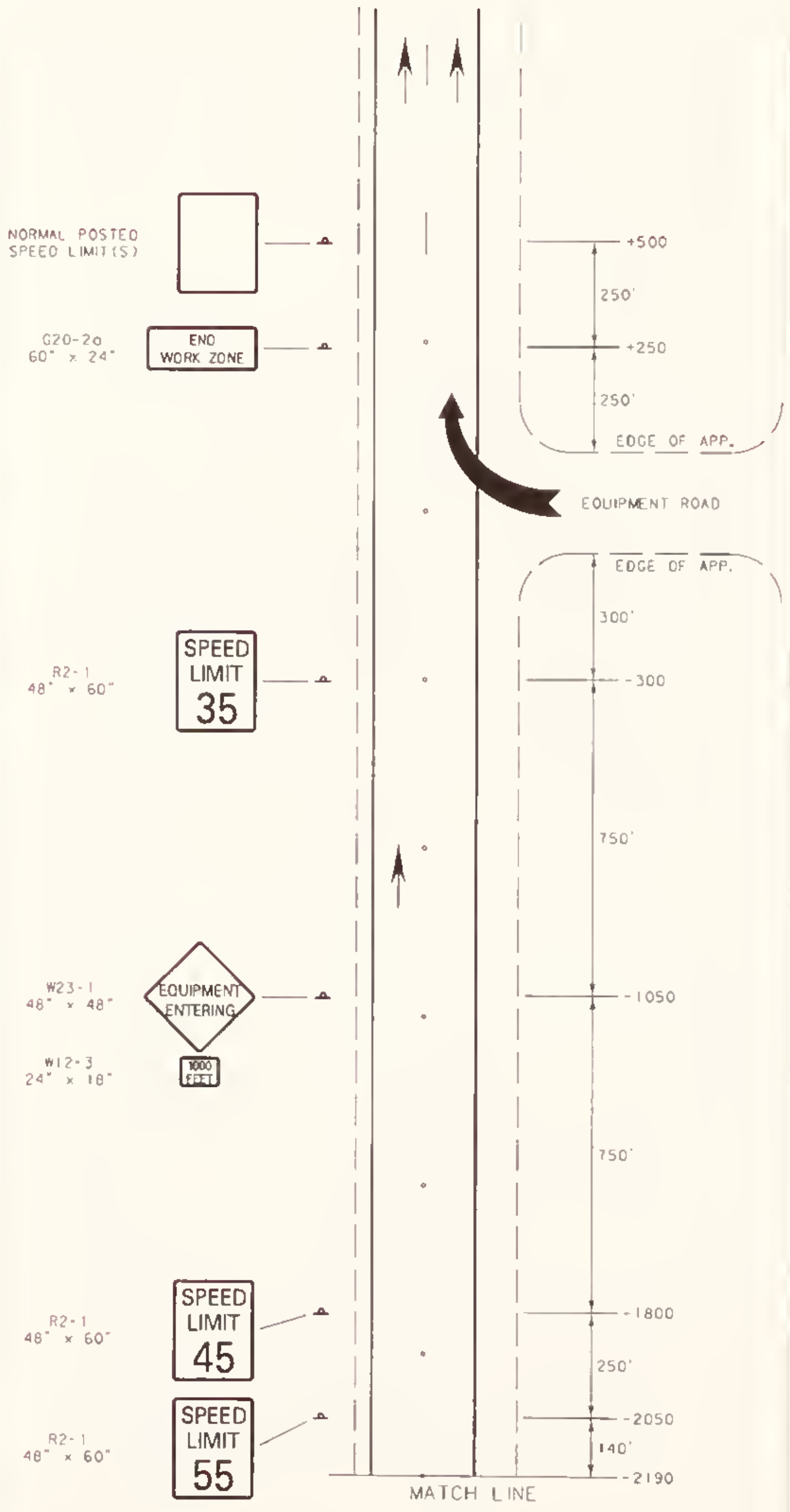
FOUR-LANE
WORK ZONES
WITHIN PROJECT LIMITS

EFFECTIVE: AUGUST 1999

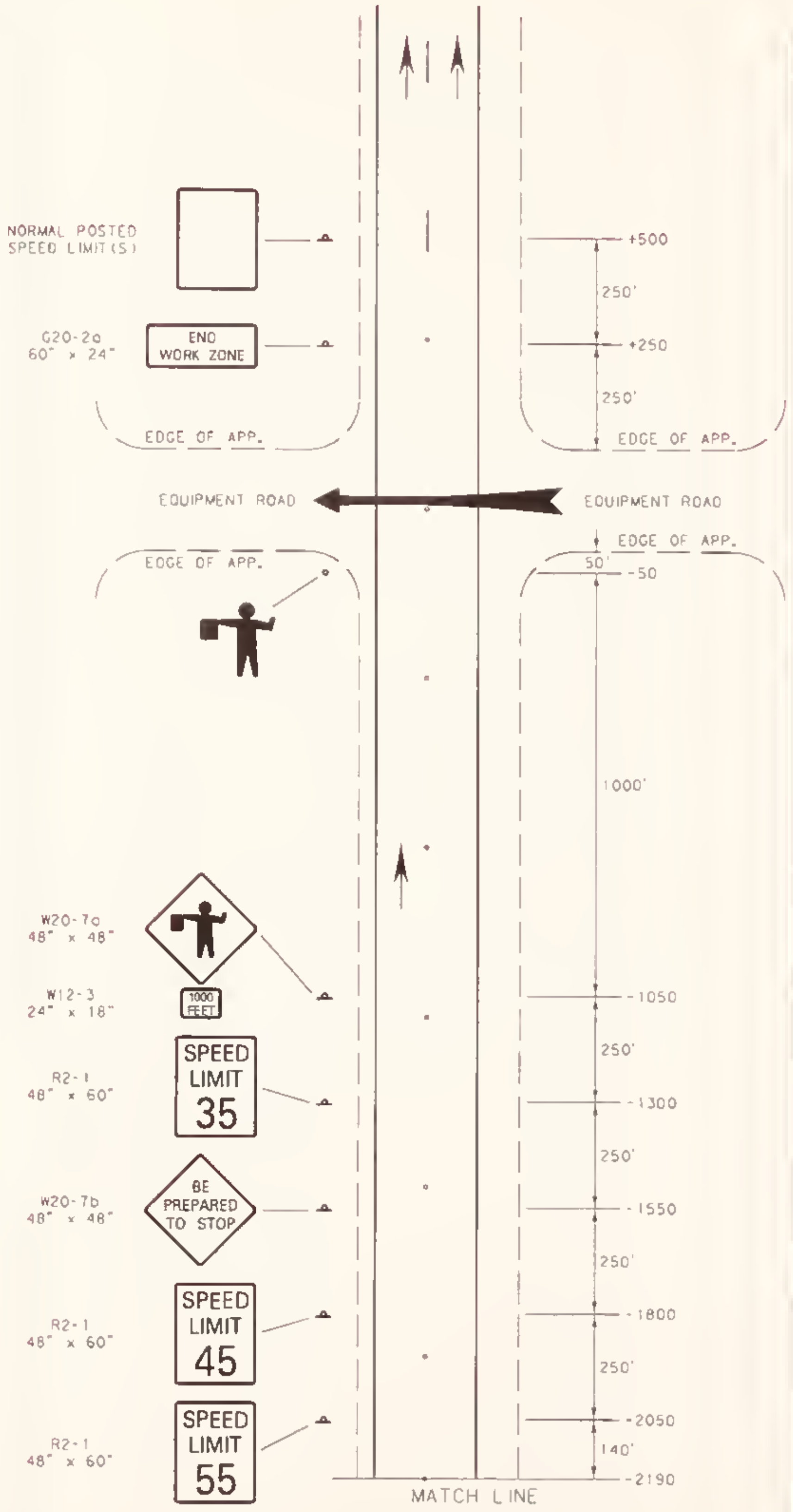
MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

NOTE:
THIS SEQUENCE OF SIGNS IS IDENTICAL FOR BOTH WORK ZONES SHOWN ON THIS DETAIL.





WORK ZONE WITH NO FLAGGER



WORK ZONE WITH FLAGGER

NOTES:

INCLUDE REGULATORY SIGNING ONLY IF THERE IS REASON TO RESTRICT SPEED WITHIN THE WORK ZONE. MODIFY REGULATORY SIGNS TO MATCH ADJACENT REGULATIONS.

USE PLASTIC DRUMS FOR CHANNELIZATION IN ALL TRANSITION SECTIONS.

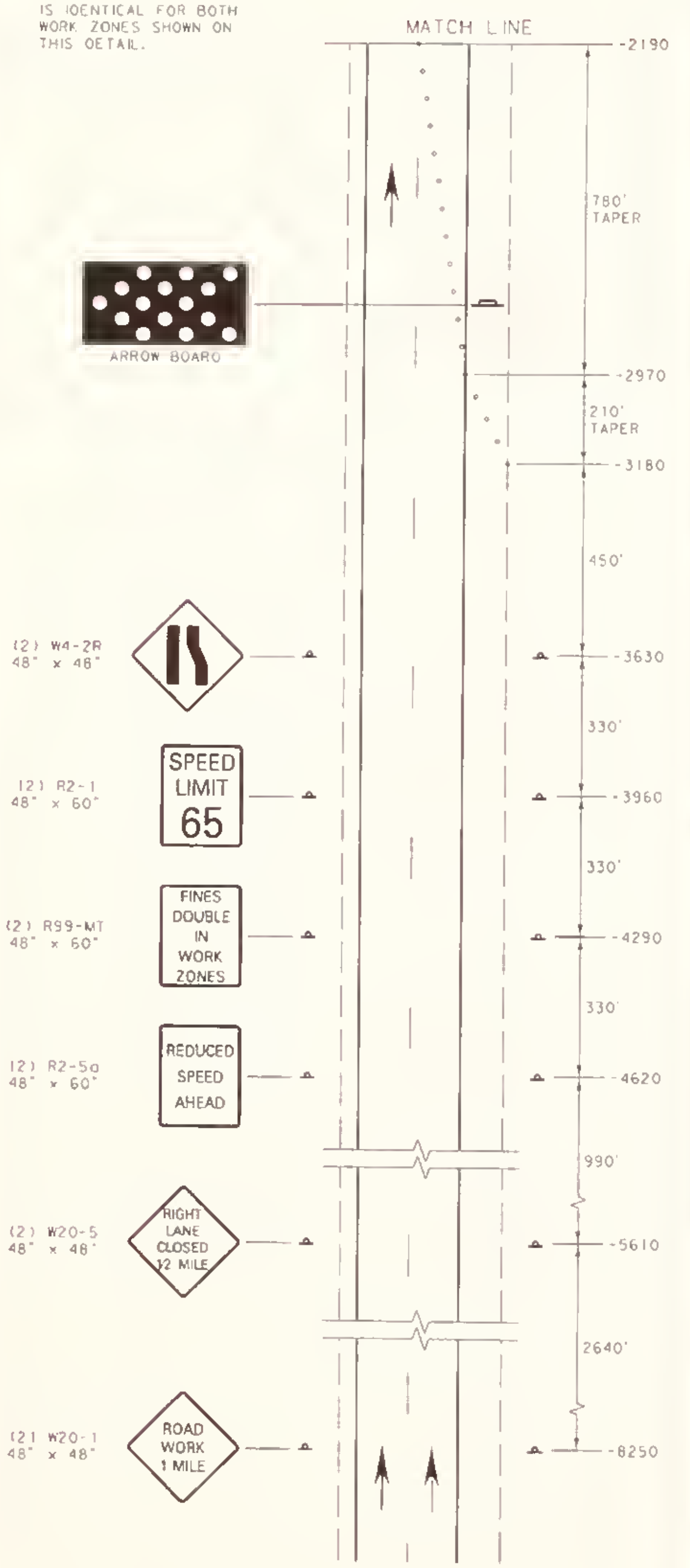
DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 618
DWG. NO.
618-26

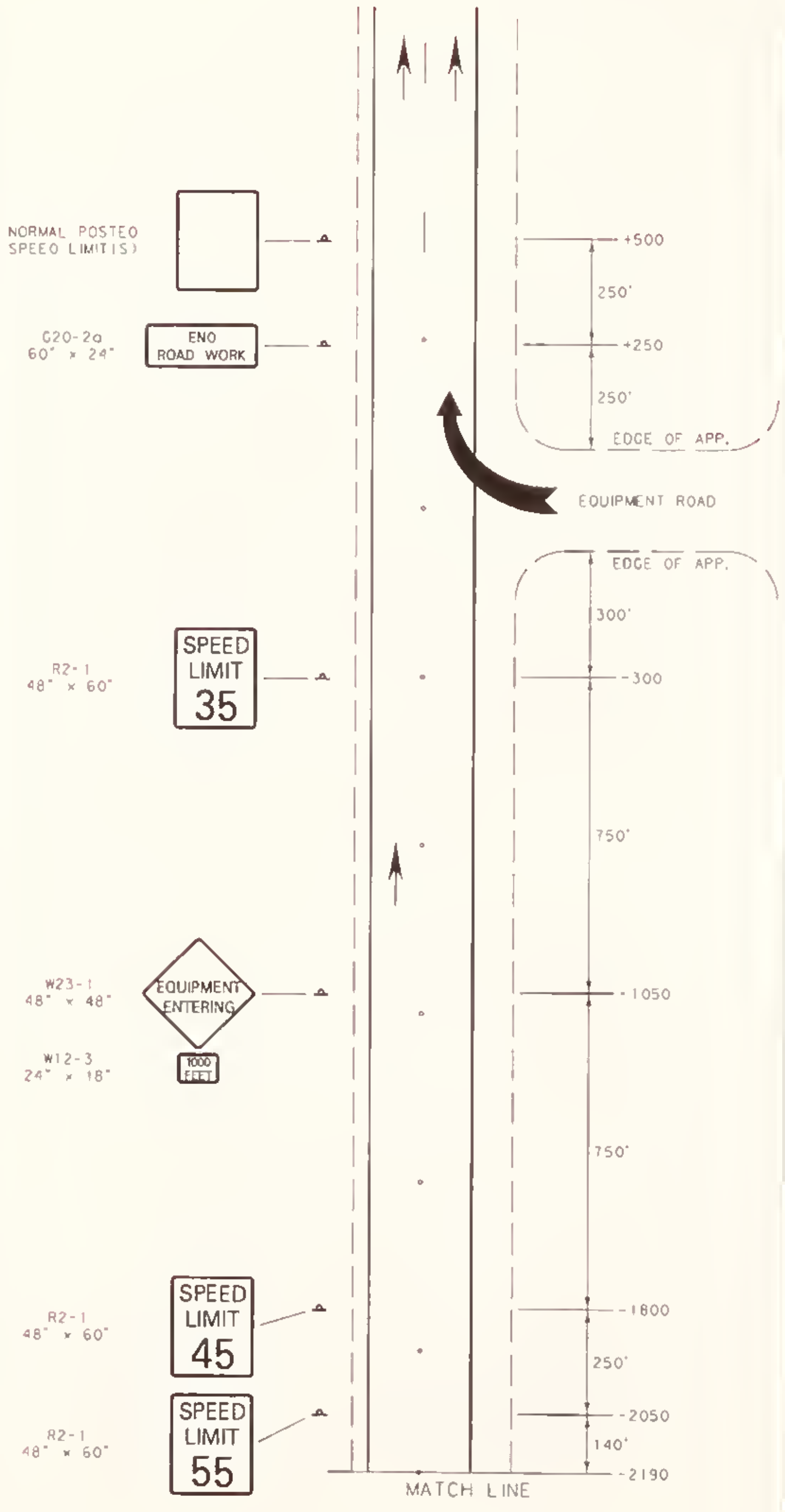
FOUR-LANE
EQUIPMENT ENTRANCES
WITHIN PROJECT LIMITS

EFFECTIVE: AUGUST 1999

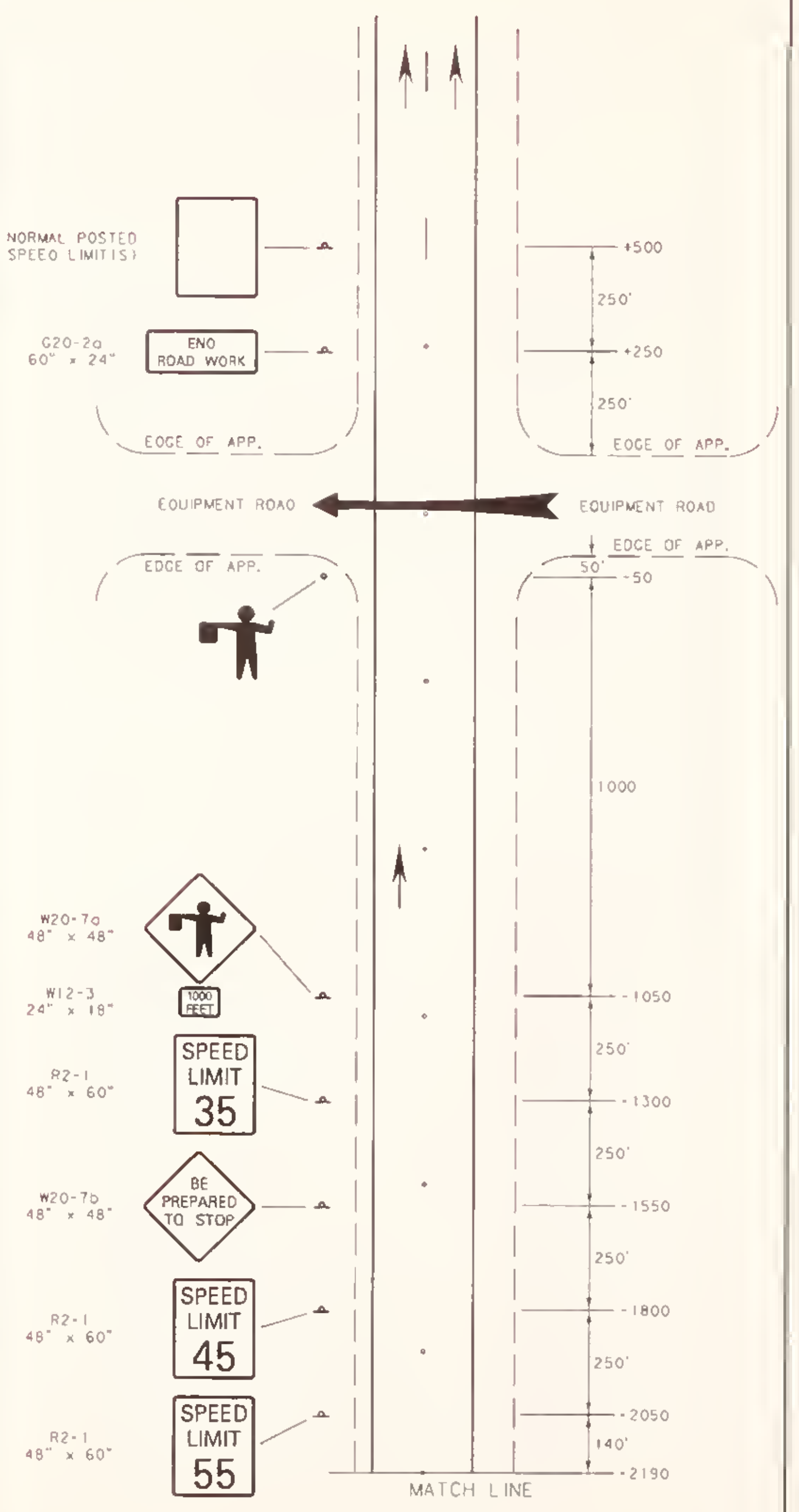
MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

NOTE:
THIS SEQUENCE OF SIGNS IS IDENTICAL FOR BOTH WORK ZONES SHOWN ON THIS DETAIL.





WORK ZONE WITH NO FLAGGER



WORK ZONE WITH FLAGGER

NOTES:

INCLUDE REGULATORY SIGNING ONLY IF THERE IS REASON TO RESTRICT SPEED WITHIN THE WORK ZONE. MODIFY REGULATORY SIGNS TO MATCH ADJACENT REGULATIONS.

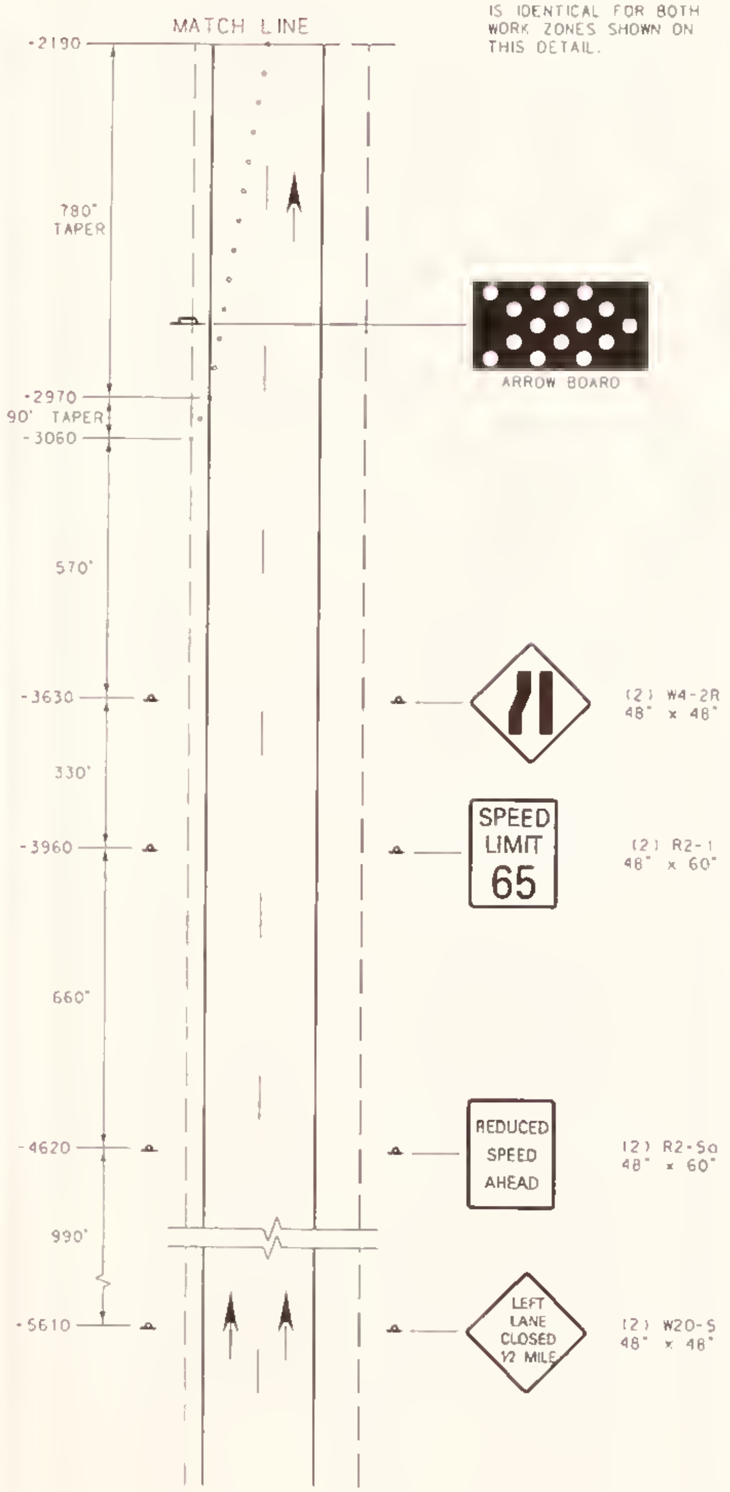
USE PLASTIC DRUMS FOR CHANNELIZATION IN ALL TRANSITION SECTIONS.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 618
DWG. NO.
618-27

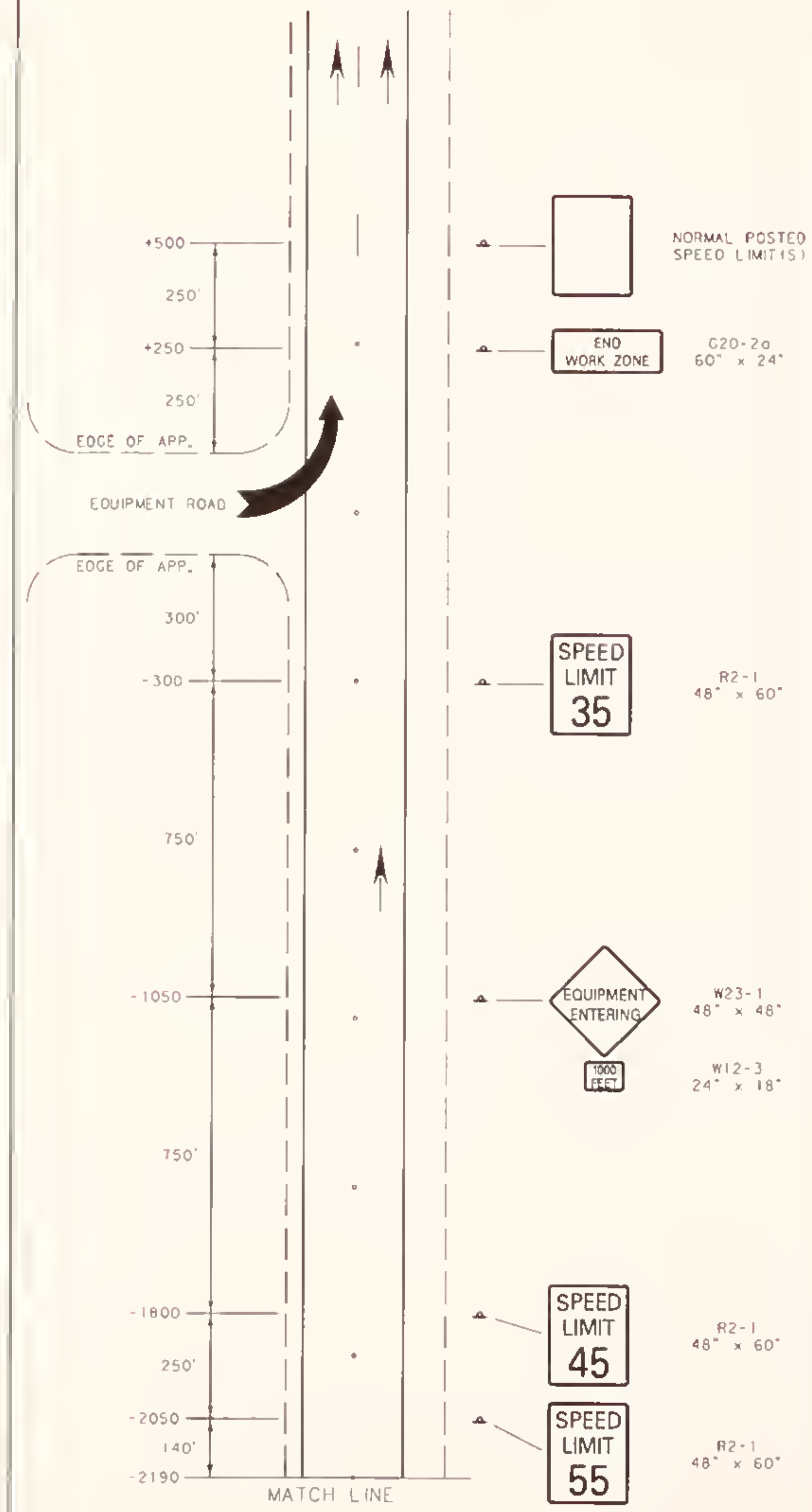
FOUR-LANE
EQUIPMENT ENTRANCES
OUTSIDE PROJECT LIMITS

EFFECTIVE: AUGUST 1999

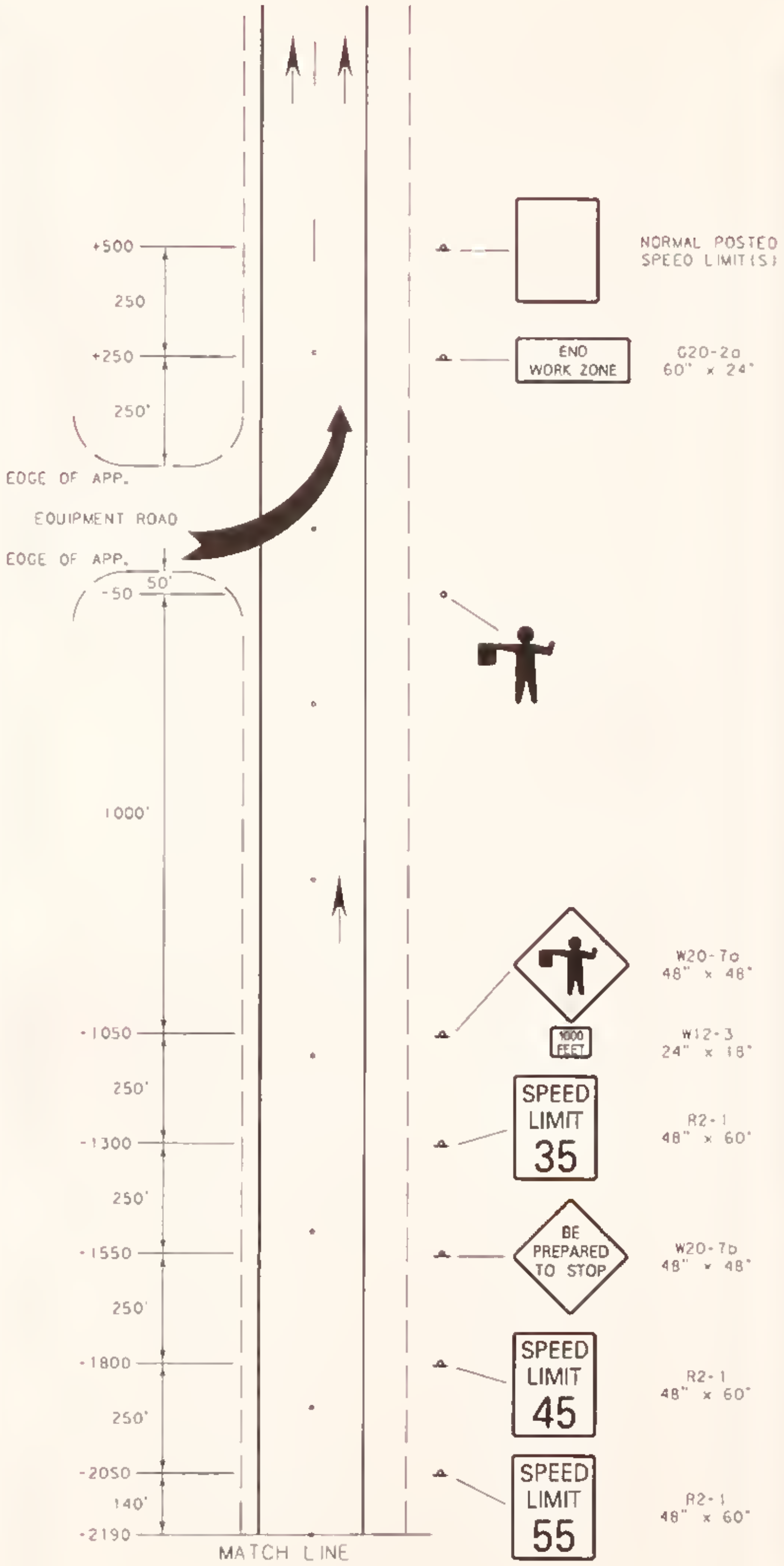
MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



NOTE:
THIS SEQUENCE OF SIGNS IS IDENTICAL FOR BOTH WORK ZONES SHOWN ON THIS DETAIL.



WORK ZONE WITH NO FLAGGER
(USE WITH WIDE MEDIANS)



WORK ZONE WITH FLAGGER
(USE WITH NARROW MEDIANS)

NOTES:

INCLUDE REGULATORY SIGNING ONLY IF THERE IS REASON TO RESTRICT SPEED WITHIN THE WORK ZONE. MODIFY REGULATORY SIGNS TO MATCH ADJACENT REGULATIONS.

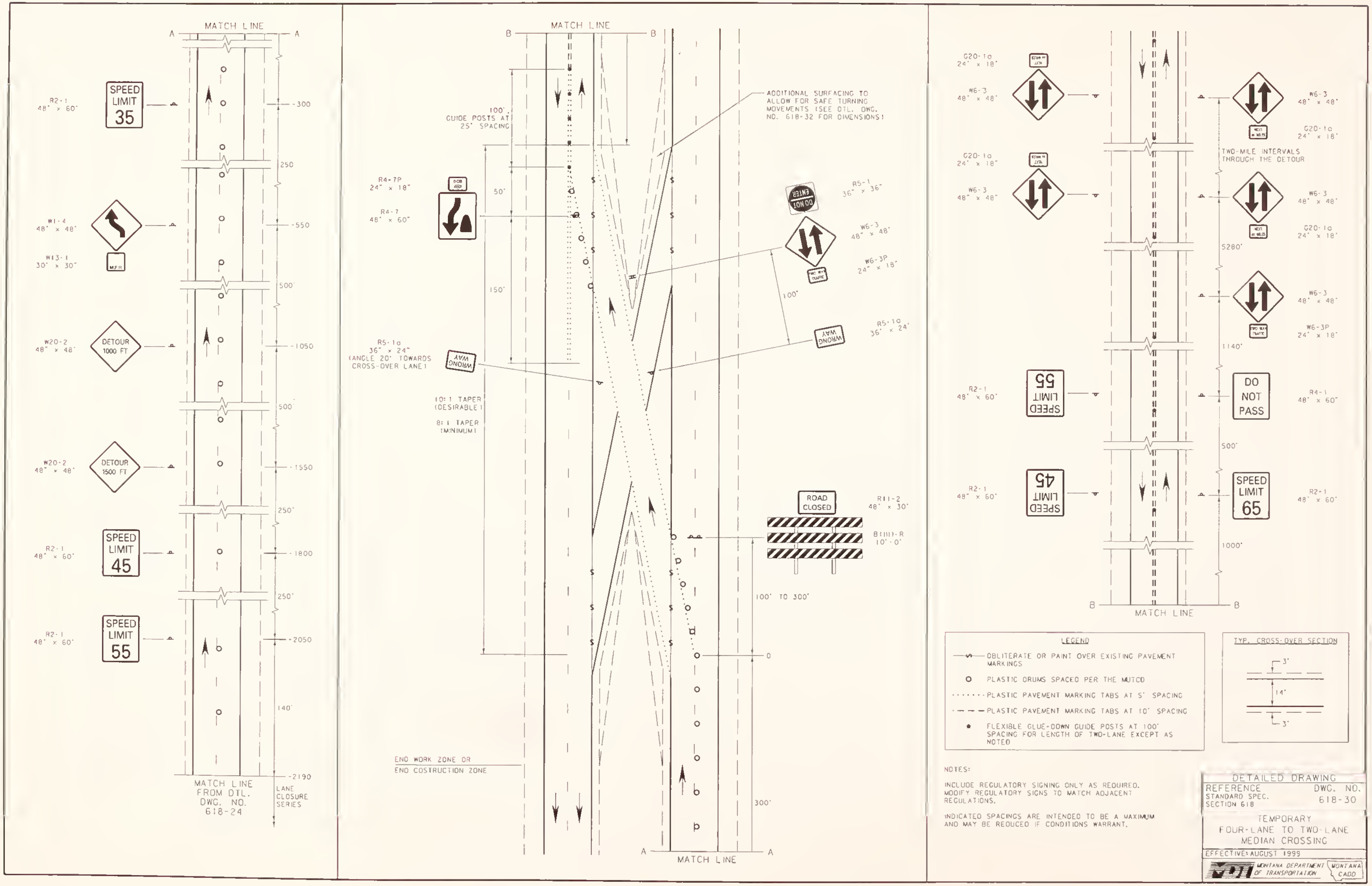
USE PLASTIC DRUMS FOR CHANNELIZATION IN ALL TRANSITION SECTIONS.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 618
DWG. NO.
618-28

FOUR-LANE
MEDIAN CROSSINGS

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



LEGEND

- OBLITERATE OR PAINT OVER EXISTING PAVEMENT MARKINGS
- ○ PLASTIC DRUMS SPACED PER THE MUTCD
- ······· PLASTIC PAVEMENT MARKING TABS AT 5' SPACING
- — — — PLASTIC PAVEMENT MARKING TABS AT 10' SPACING
- ● FLEXIBLE GLUE-DOWN GUIDE POSTS AT 100' SPACING FOR LENGTH OF TWO-LANE EXCEPT AS NOTED

NOTES:

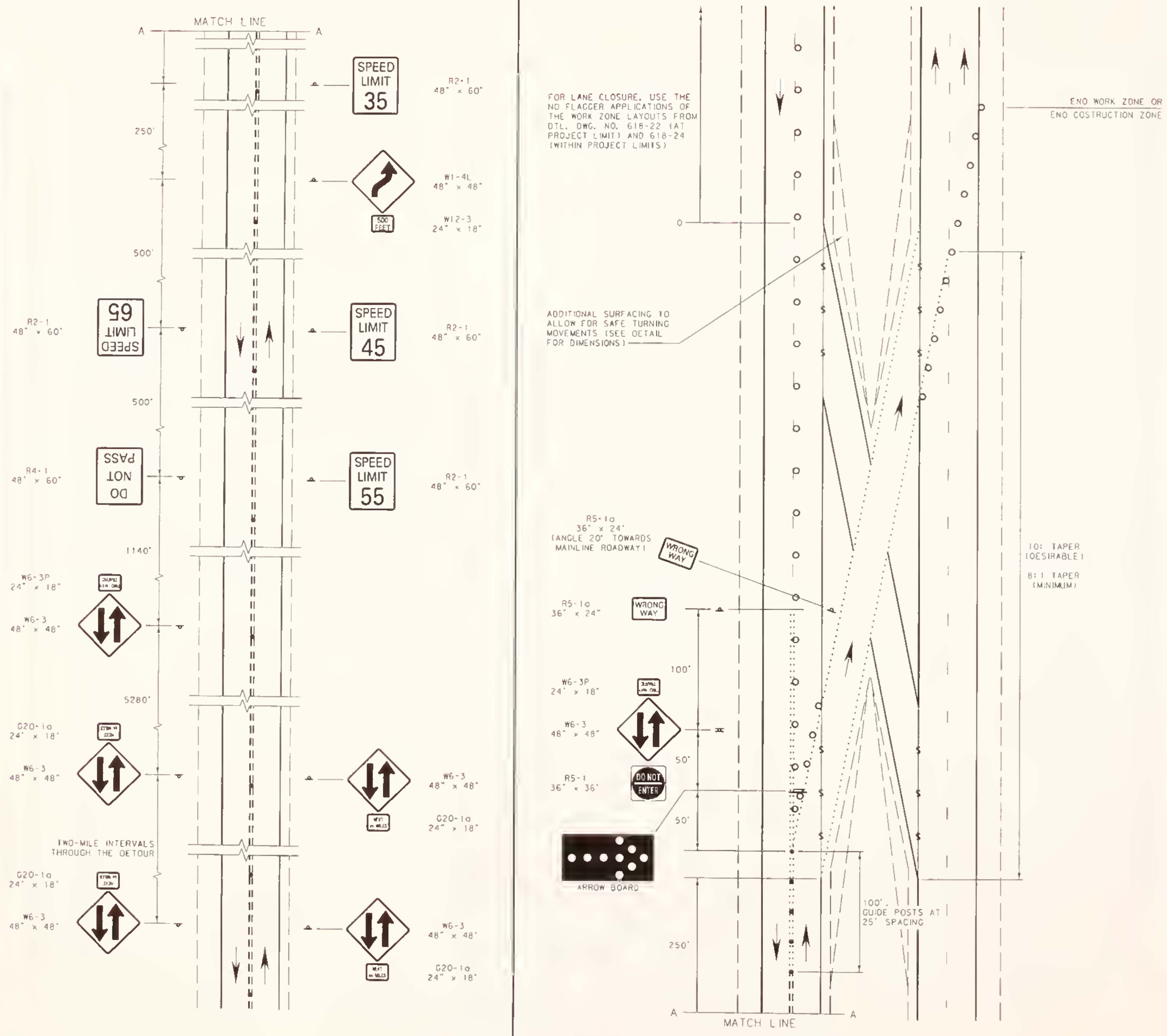
INCLUDE REGULATORY SIGNING ONLY AS REQUIRED. MODIFY REGULATORY SIGNS TO MATCH ADJACENT REGULATIONS.

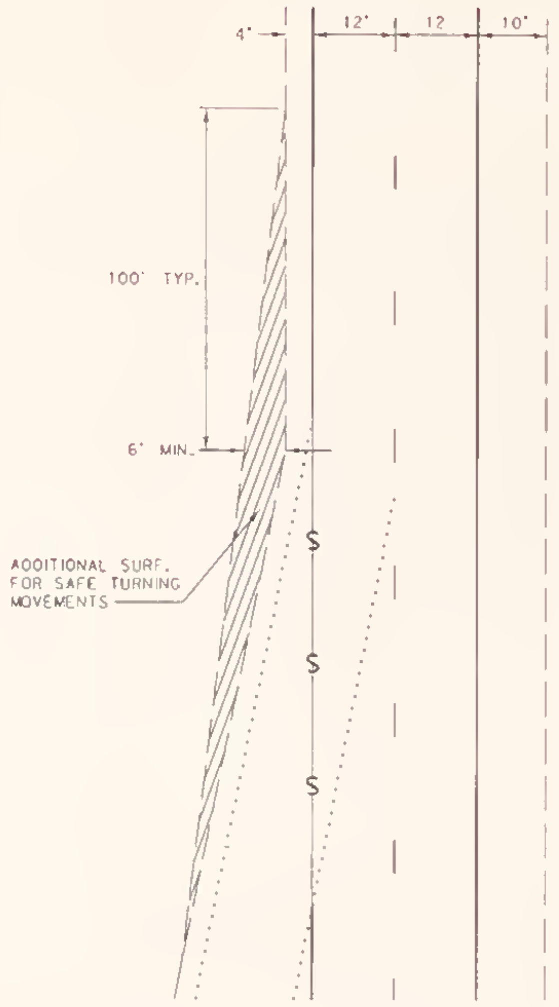
INDICATED SPACINGS ARE INTENDED TO BE A MAXIMUM AND MAY BE REDUCED IF CONDITIONS WARRANT.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 618
DWG. NO.
618-30

TEMPORARY
FOUR-LANE TO TWO-LANE
MEDIAN CROSSING

EFFECTIVE: AUGUST 1999
MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD





ADDITIONAL SURFACING DETAIL

LEGEND

—✕—	OBLITERATE OR PAINT OVER EXISTING PAVEMENT MARKINGS
○	PLASTIC DRUMS SPACED PER THE MUTCD
·······	PLASTIC PAVEMENT MARKING TABS AT 5' SPACING
— — —	PLASTIC PAVEMENT MARKING TABS AT 10' SPACING
●	FLEXIBLE GLUE-DOWN GUIDE POSTS AT 100' SPACING FOR LENGTH OF TWO-LANE EXCEPT AS NOTED

NOTES:

INCLUDE REGULATORY SIGNING ONLY AS REQUIRED. MODIFY REGULATORY SIGNS TO MATCH ADJACENT REGULATIONS.

SEE DTL. DWG. NO. 618-30 FOR TYPICAL CROSS-OVER SECTION DIMENSIONS.

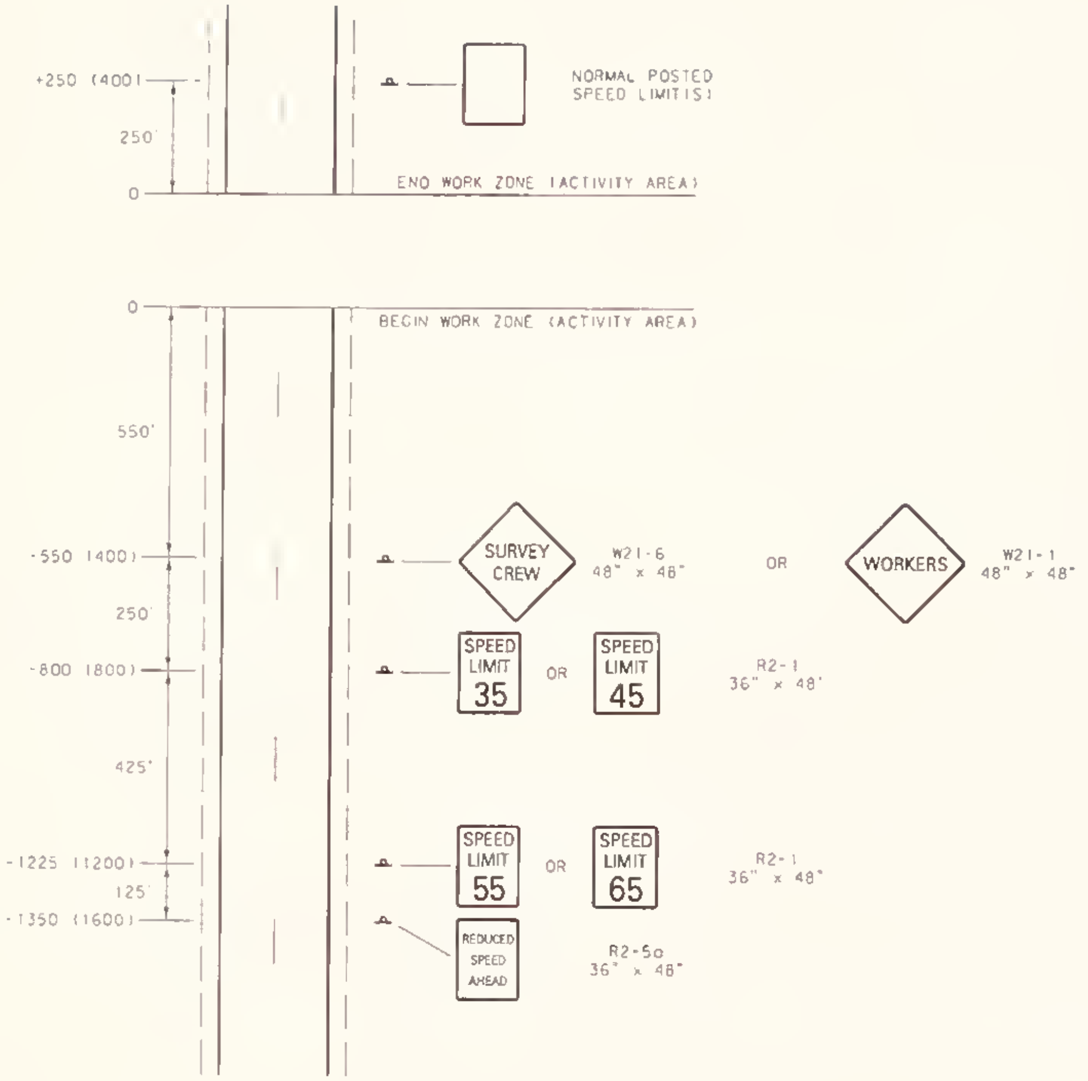
INDICATED SPACINGS ARE INTENDED TO BE A MAXIMUM AND MAY BE REDUCED IF CONDITIONS WARRANT.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 618
DWG. NO.
618-32

TEMPORARY
TWO-LANE TO FOUR-LANE
MEDIAN CROSSING

EFFECTIVE: AUGUST 1999

MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



NOTES:

SHORT DURATION ACTIVITIES ARE DEFINED AS THOSE LASTING UP TO ONE HOUR.

USE THIS SIGN LAYOUT WHEN WORK IS TO TAKE PLACE ON THE TRAVELED WAY. SIGNING FOR WORK ON OR NEAR THE SHOULDER MAY BE LIMITED TO THE USE OF TWO 48" WARNING SIGNS AND WORK OUTSIDE THE SHOULDER TO THE USE OF ONE 48" WARNING SIGN.

SIGN BOTH TRAVEL DIRECTIONS ON TWO-LANE, TWO-WAY ROADWAYS OR BOTH SHOULDERS ON TWO-LANE, ONE-WAY ROADWAYS.

DISTANCES SHOWN IN PARENTHESES ARE FOR DELINEATOR MOUNTED SIGNS ONLY.

SEE DTL. DWG. NO. 618-36 "SHORT-TERM STATIONARY CREW SIGNING" IF THE DOUBLE PENALTY REGULATION IS TO BE UTILIZED.

DURATION - MUTCD: 6G-2

Short duration: up to 1 hr.
Traffic affected as control increases.
Simplified controls may be warranted.
Short-term stationary: 1 to 12 hr.
Most maintenance, survey work.
Reflective devices should be used.

61-8-314, MCA:

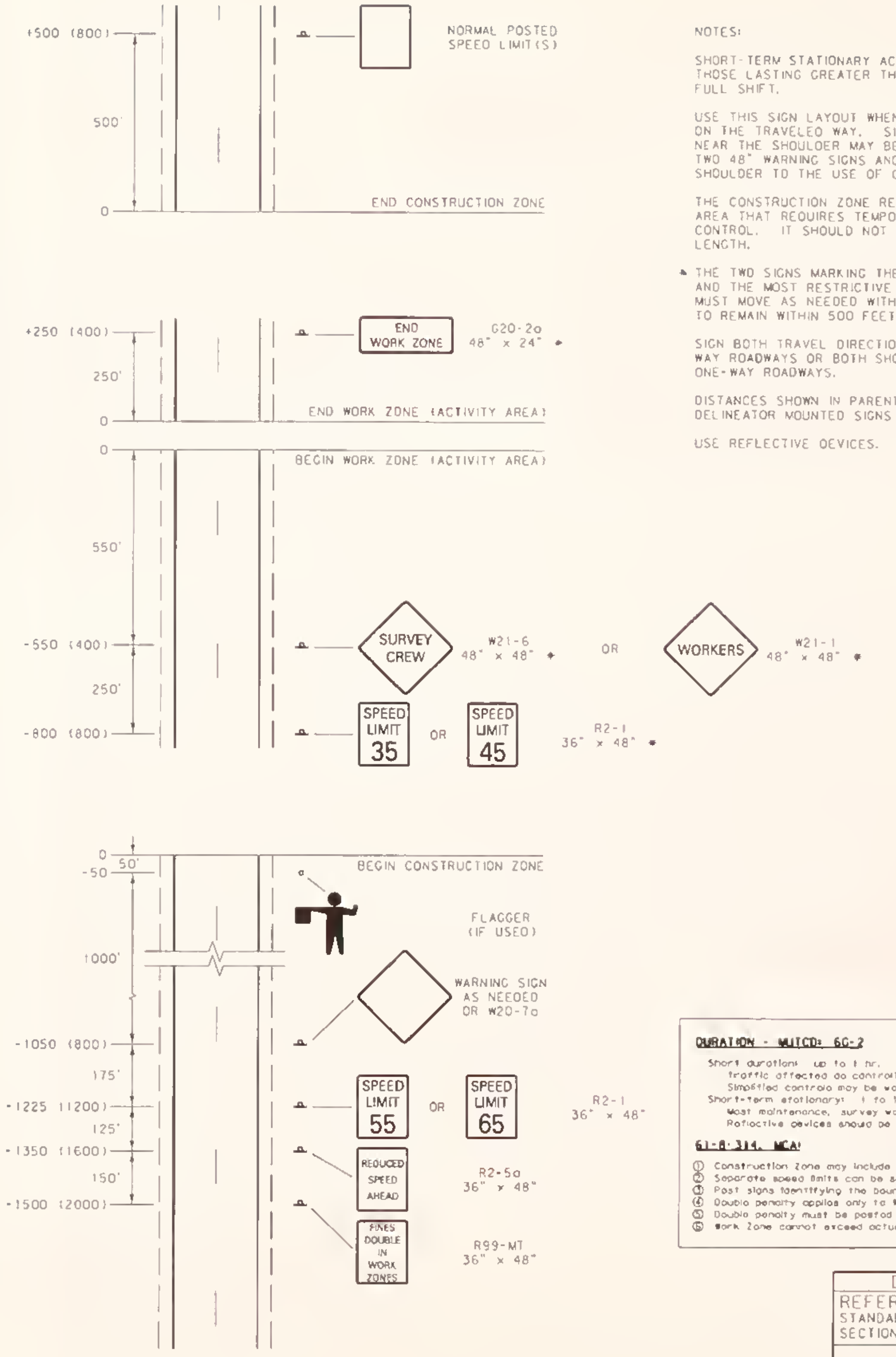
① Construction Zone may include a Work Zone
② Separate speed limits can be set for each.
③ Post signs identifying the boundaries of each.
④ Double penalty applies only to Work Zone.
⑤ Double penalty must be posted at Construction Zone boundary.
⑥ Work Zone cannot exceed actual activity area more than 500 ft.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 618
DWG. NO.
618-34

SHORT DURATION
CREW SIGNING

EFFECTIVE: AUGUST 1999

MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



NOTES:

SHORT-TERM STATIONARY ACTIVITIES ARE DEFINED AS THOSE LASTING GREATER THAN ONE HOUR, UP TO A FULL SHIFT.

USE THIS SIGN LAYOUT WHEN WORK IS TO TAKE PLACE ON THE TRAVELED WAY. SIGNING FOR WORK ON OR NEAR THE SHOULDER MAY BE LIMITED TO THE USE OF TWO 48" WARNING SIGNS AND WORK OUTSIDE THE SHOULDER TO THE USE OF ONE 48" WARNING SIGN.

THE CONSTRUCTION ZONE REFERS TO THE GENERAL AREA THAT REQUIRES TEMPORARY WORK ZONE TRAFFIC CONTROL. IT SHOULD NOT EXCEED THREE MILES IN LENGTH.

* THE TWO SIGNS MARKING THE WORK ZONE BOUNDARIES AND THE MOST RESTRICTIVE REGULATORY SPEED SIGN MUST MOVE AS NEEDED WITHIN THE CONSTRUCTION ZONE TO REMAIN WITHIN 500 FEET OF THE WORK ACTIVITY.

SIGN BOTH TRAVEL DIRECTIONS ON TWO-LANE, TWO-WAY ROADWAYS OR BOTH SHOULDERS ON TWO-LANE, ONE-WAY ROADWAYS.

DISTANCES SHOWN IN PARENTHESES ARE FOR DELINEATOR MOUNTED SIGNS ONLY.

USE REFLECTIVE DEVICES.

DURATION - MUTCD: 6G-2

Short duration: up to 1 hr.
Traffic affected as control increases.
Simplified controls may be warranted.
Short-term stationary: 1 to 12 hr.
Most maintenance, survey work.
Reflective devices should be used.

61-8-314, MCA:

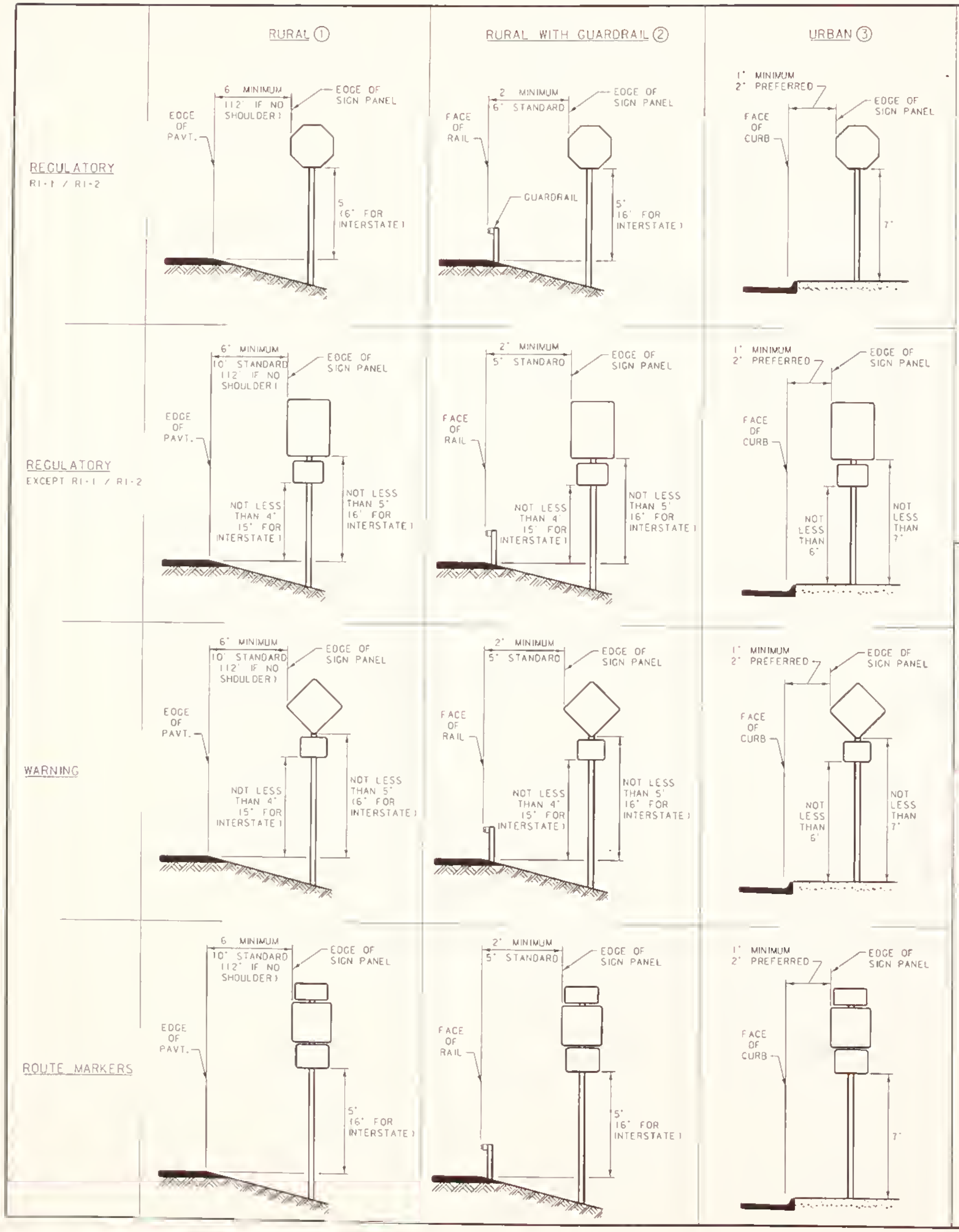
① Construction Zone may include a Work Zone.
② Separate speed limits can be set for each.
③ Post signs identifying the boundaries of each.
④ Double penalty applies only to Work Zone.
⑤ Double penalty must be posted at Construction Zone boundary.
⑥ Work Zone cannot exceed actual activity area more than 500 ft.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 618
DWG. NO.
618-36

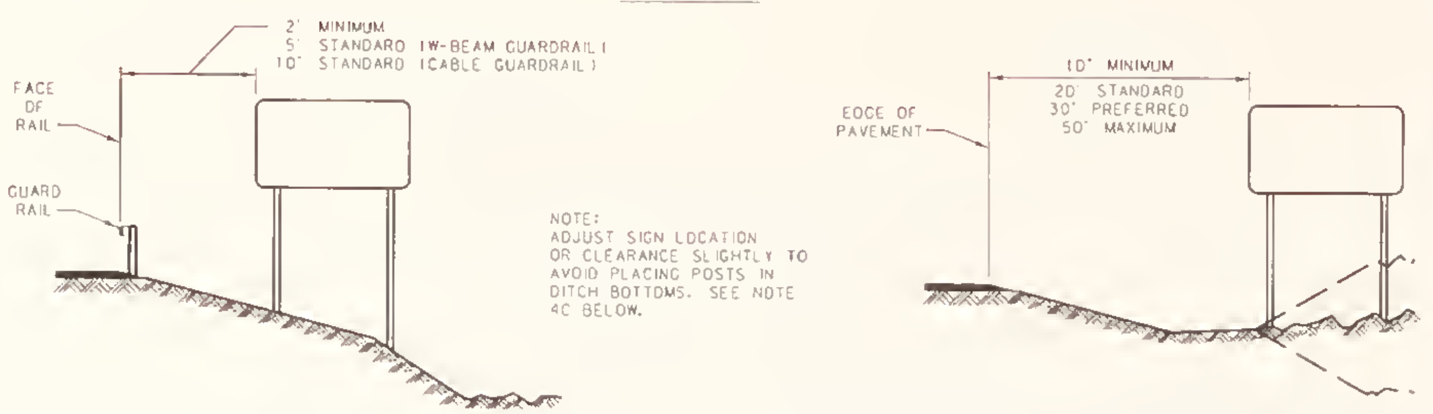
SHORT-TERM
STATIONARY
CREW SIGNING

EFFECTIVE: AUGUST 1999

MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



GUIDE SIGNS



NOTE:
ADJUST SIGN LOCATION OR CLEARANCE SLIGHTLY TO AVOID PLACING POSTS IN DITCH BOTTOMS. SEE NOTE 4C BELOW.

NOTES:

1. PLACE ALL SIGNS AT THE CLEARANCE AND MOUNTING HEIGHTS SHOWN.
2. FOR REGULATORY, WARNING AND ROUTE MARKER SIGNS, AND THEIR ASSEMBLIES, ON HIGHWAYS OTHER THAN INTERSTATE:
   A) USE DIAGRAMS LOCATED IN COLUMN ① WHEN PLACING THESE SIGNS IN STANDARD RURAL CONDITIONS. USE COLUMN ② WHEN PLACING THESE SIGNS BEHIND GUARDRAIL IN RURAL CONDITIONS. USE COLUMN ③ WHEN PLACING THESE SIGNS IN URBAN CONDITIONS WHERE THERE IS ADEQUATE CLEARANCE AND SIDEWALK WIDTH.
   B) WHERE SIDEWALK WIDTH IS LIMITED IN URBAN CONDITIONS, SEE DTL. DWG. NO. 619-18 FOR PLACEMENT DETAILS.
3. FOR REGULATORY (ALL OTHER), WARNING AND ROUTE MARKER SIGNS, AND THEIR ASSEMBLIES, ON INTERSTATE HIGHWAYS:
   THE CLEARANCE IS 20' FROM THE EDGE OF PAVEMENT IN COLUMN ① FOR STANDARD RURAL CONDITIONS. THE CLEARANCES LISTED IN COLUMNS ② AND ③ REMAIN AS SHOWN.
4. FOR GUIDE SIGNS AND THEIR ASSEMBLIES:
   A) USE THE DIAGRAMS LOCATED ABOVE WHEN PLACING THESE SIGNS IN THE GIVEN RURAL CONDITIONS.
   B) FOR PLACEMENT OF THESE SIGNS IN URBAN CONDITIONS, SEE THE SIGN LOCATION AND SPECIFICATION SHEETS IN THE SIGNING PLANS FOR EACH INDIVIDUAL SIGN.
   C) THE MAXIMUM CLEARANCE OF THESE SIGNS IS 50' IN ANY CONDITION.
   D) SEE DTL. DWG. NO. 619-08 FOR MOUNTING HEIGHTS.
5. WITHIN THE CITY LIMITS OR IN A SIDEWALK AND CURB AREA, MOUNT SIGNS TO HAVE THE PROPER CLEARANCES, BUT AVOID ANY CONFLICT BETWEEN THE POST AND THE MAIN WALKING AREA OF THE SIDEWALK, OR WITH DOORWAYS OR WINDOWS OF ADJACENT BUILDINGS. THE EXACT LOCATION OF THESE SIGN INSTALLATIONS WILL BE DETERMINED BY THE ENGINEER. SEE DTL. DWG. NO. 619-18 FOR VARIOUS CANTILEVER TYPE MOUNTINGS.
6. EVALUATE SIGNS WITHIN CLEAR ZONES (TABLES BELOW) FOR SUPPORT BREAKAWAY REQUIREMENTS (CONTACT MDT TRAFFIC SECTION FOR CRITERIA).

CLEAR ZONE DISTANCES
(IN FEET FROM EDGE OF DRIVING LANE)

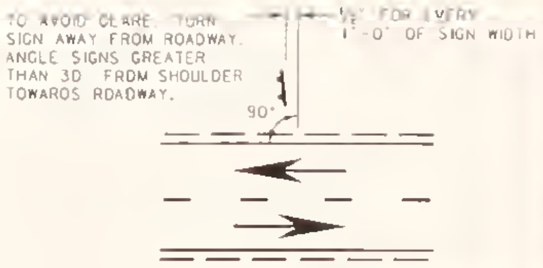
DESIGN SPEED	DESIGN ADT	FILL SLOPES			CUT SLOPES		
		6:1 OR FLATTER	5:1 TO 4:1	3:1	3:1	4:1 TO 5:1	6:1 OR FLATTER
40 MPH OR LESS	UNDER 750	7-10	7-10	**	7-10	7-10	7-10
	750-1499	10-12	12-14	**	10-12	10-12	10-12
	1500-6000	12-14	14-16	**	12-14	12-14	12-14
	OVER 6000	14-16	16-18	**	14-16	14-16	14-16
45-50 MPH	UNDER 750	10-12	12-14	**	8-10	8-10	10-12
	750-1499	12-14	16-20	**	10-12	12-14	12-14
	1500-6000	16-18	20-26	**	12-14	14-16	16-18
	OVER 6000	18-20	20-24	**	12-14	18-20	20-22
55 MPH	UNDER 750	12-14	14-18	**	8-10	16-18	10-12
	750-1499	16-18	20-24	**	18-18	14-16	16-18
	1500-6000	20-22	24-30	**	14-16	16-18	20-22
	OVER 6000	22-24	26-32 *	**	16-18	20-22	20-24
60 MPH	UNDER 750	16-18	20-24	**	10-12	12-14	14-16
	750-1499	20-22	26-32 *	**	10-12	16-18	20-22
	1500-6000	26-30	32-40 *	**	14-18	18-22	24-26
	OVER 6000	30-32 *	36-44 *	**	20-22	24-26	26-28
65-70 MPH	UNDER 750	18-20	20-26	**	10-12	14-16	14-16
	750-1499	24-26	28-36 *	**	12-16	18-20	20-22
	1500-6000	28-32 *	34-42 *	**	16-20	22-24	26-28
	OVER 6000	30-34 *	38-46 *	**	22-24	26-30	28-30

* WHEN AN INVESTIGATION OR ACCIDENT HISTORY INDICATES A HIGH PROBABILITY OF ACCIDENTS, CLEAR ZONE DISTANCES GREATER THAN 30' MAY BE PROVIDED AS INDICATED. CLEAR ZONES MAY ALSO BE LIMITED TO 30' TO PROVIDE A CONSISTENT ROADWAY TEMPLATE WHEN EXPERIENCE WITH PREVIOUS SIMILAR PROJECTS INDICATES SATISFACTORY PERFORMANCE.

** FIXED OBJECTS, INCLUDING SIGN POSTS, SHOULD NOT BE ALLOWED IN THE VICINITY OF THE TOE OF THESE SLOPES. SEE AASHTO ROADSIDE DESIGN GUIDE FOR ADDITIONAL CONSIDERATIONS IN LOCATING SIGNS.

HORIZONTAL CURVE ADJUSTMENTS
(APPLICALBLE ON OUTSIDE OF CURVE ONLY)

DEGREE OF CURVE	DESIGN SPEED (MPH)						
	40	45	50	55	60	65	70
2.0	1.08	1.10	1.12	1.15	1.19	1.22	1.27
2.5	1.10	1.12	1.15	1.19	1.23	1.28	1.33
3.0	1.11	1.15	1.18	1.23	1.28	1.33	1.40
3.5	1.13	1.17	1.22	1.26	1.32	1.39	1.46
4.0	1.15	1.19	1.25	1.30	1.37	1.44	
4.5	1.17	1.22	1.28	1.34	1.41	1.49	
6.0	1.19	1.24	1.31	1.37	1.46		
6.0	1.24	1.29	1.36	1.45	1.54		
7.0	1.26	1.34	1.42	1.52			
6.0	1.30	1.38	1.48				
9.0	1.34	1.29	1.53				
10.0	1.41	1.41					
15.0	1.54						


TO AVOID GLARE, TURN SIGN AWAY FROM ROADWAY. ANGLE SIGNS GREATER THAN 3D FROM SHOULDER TOWARDS ROADWAY.
½" FOR EVERY 1'-0" OF SIGN WIDTH
90°

SKEW DIAGRAM

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 619
DWG. NO.
619-00

SIGN CLEARANCES AND
MOUNTING HEIGHTS

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

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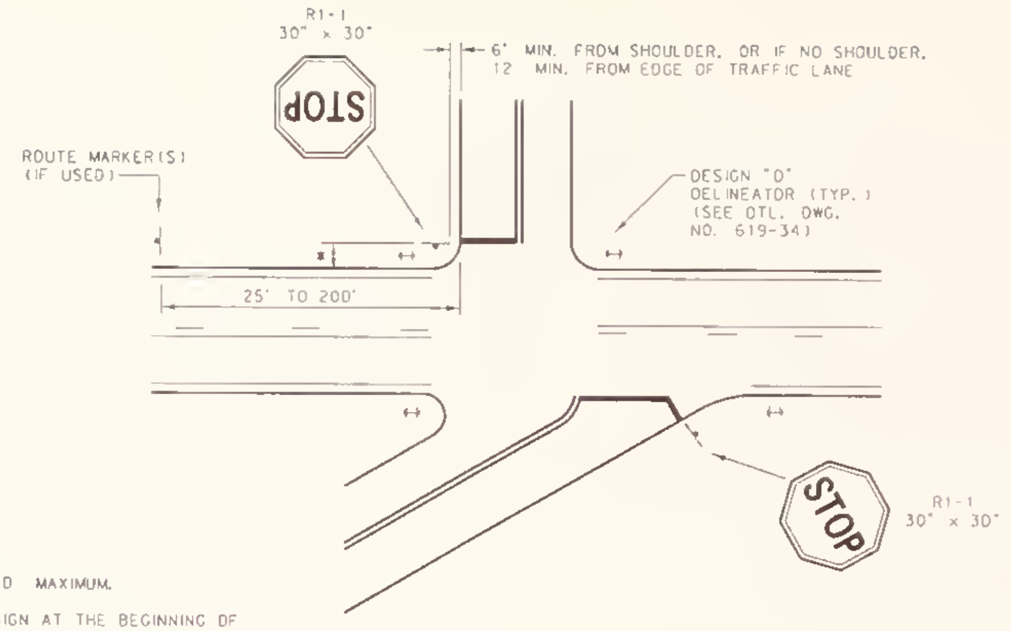


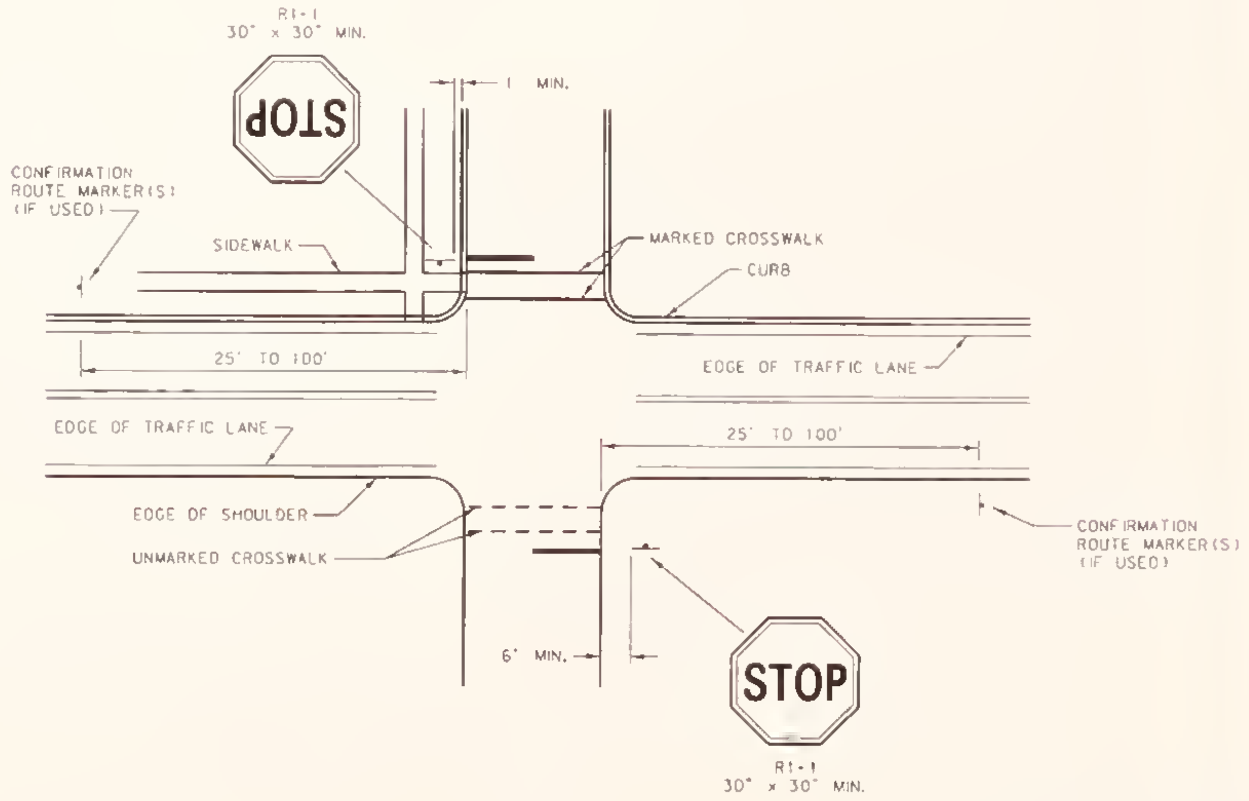
RURAL

NOTES:

* 6' MINIMUM; 50 MAXIMUM.

PLACE R1-1 SIGN AT THE BEGINNING OF CURB RADIUS OR SHOULDER RADIUS, OR 4 FEET MIN. IN ADVANCE OF THE MARKED OR UNMARKED CROSSWALK.

SEE PLANS FOR FINAL SIGNING AND PAVEMENT MARKING LOCATIONS.



URBAN

DETAILED DRAWING

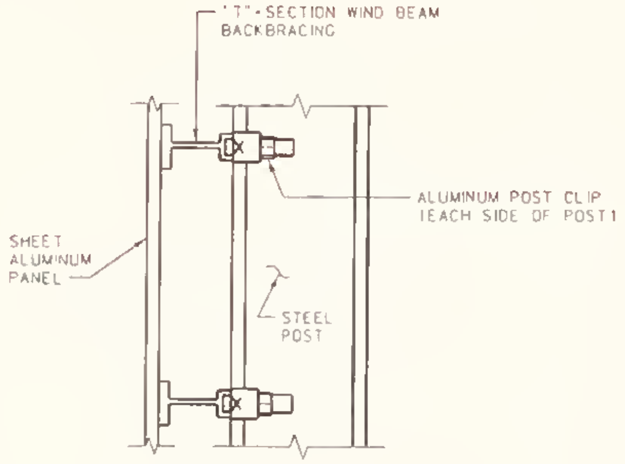
REFERENCE
STANDARD SPEC.
SECTION 619

DWG. NO.
619-02

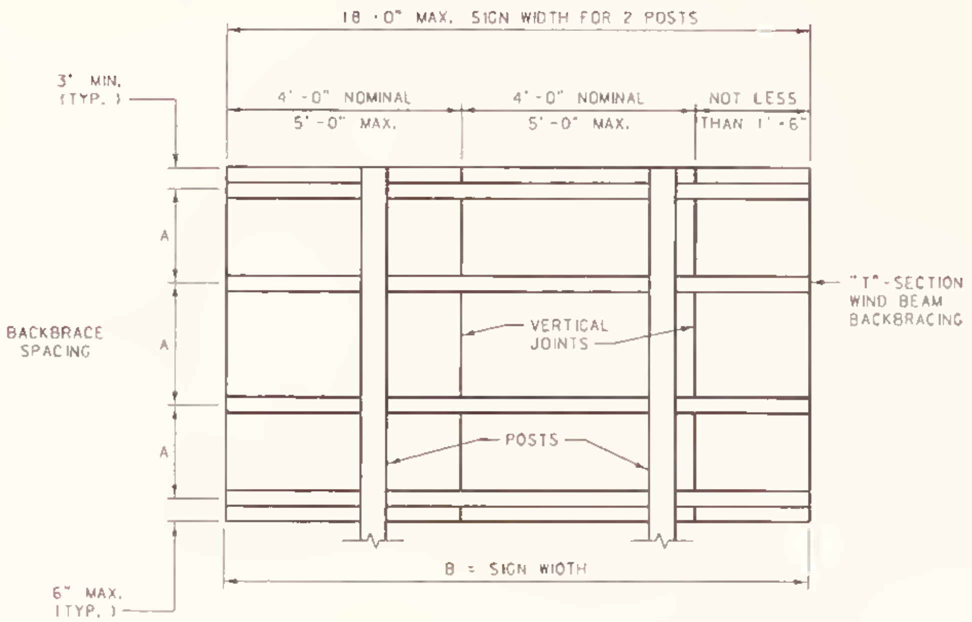
TYPICAL
RURAL AND URBAN
APPROACHES

EFFECTIVE: AUGUST 1999

MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD


"T"-SECTION WIND BEAM BACKBRACING
ALUMINUM POST CLIP (EACH SIDE OF POST)
SHEET ALUMINUM PANEL
STEEL POST

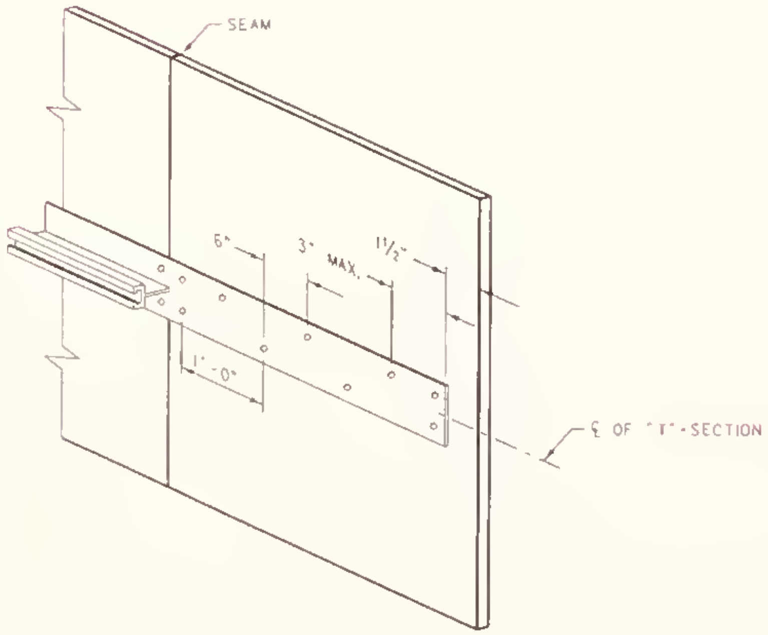
BACKBRACE DETAIL



MAXIMUM BACKBRACE SPACING "A"	MAXIMUM WIDTH "B"	
	2 POST	3 POST
1'-8"	18'-0"	27'-0"
1'-10"	17'-0"	25'-8"
2'-0'	16'-6"	24'-8"
2'-6"	14'-9"	22'-0"
3'-0'	13'-6"	20'-0"
3'-6'	12'-6"	18'-6"

BACKBRACING TABLE - ALUMINUM SIGNS

FOR ALUMINUM PLATE THICKNESS INFORMATION SEE SECTION 704.01 OF THE STANDARD SPECIFICATIONS.

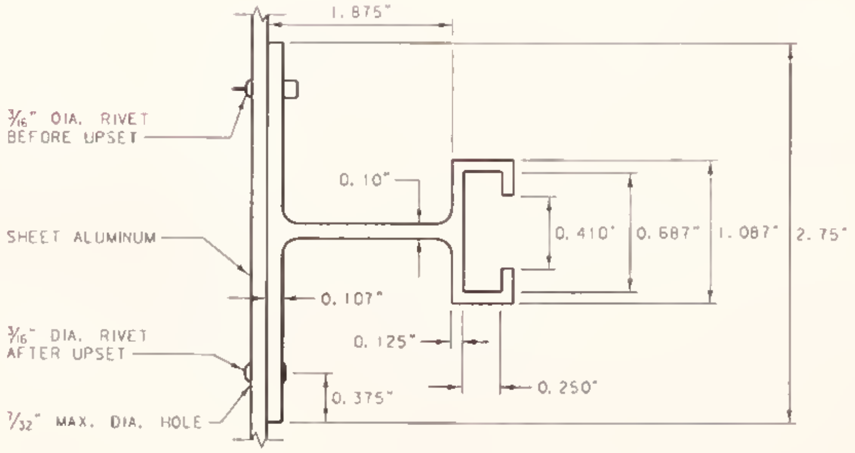


RIVET SPACING DETAIL

LOCATE RIVETS AT 6" ALTERNATE CENTERS ON HORIZONTAL EXTRUDED "T"-SECTION.

DOUBLE RIVETS (TOP AND BOTTOM OR LEFT AND RIGHT OF EXTRUDED "T"-SECTION) AT HORIZONTAL AND VERTICAL JOINTS IN SHEET ALUMINUM FACE AND AT ENDS OF EXTRUDED "T"-SECTION.

COLOR RIVET HEADS TO MATCH ADJACENT SHEETING.


1.875"
$\frac{3}{16}$" DIA. RIVET BEFORE UPSET
0.10"
SHEET ALUMINUM
0.410"
0.687"
1.087"
2.75"
0.107"
$\frac{3}{16}$" DIA. RIVET AFTER UPSET
0.125"
0.250"
0.375"
$\frac{7}{32}$" MAX. DIA. HOLE

EXTRUDED "T"-SECTION BACKBRACE

NOTES:

CONFORM ALL ALUMINUM SIGNS TO SECTIONS 619, 704.01.1 AND 704.01.2 OF THE STANDARD SPECIFICATIONS.

FOR SIGNS 4'-0" HIGH BY 6'-0" LONG OR LESS USE A SINGLE SHEET OF ALUMINUM.

DO NOT USE HORIZONTAL JOINTS ON SIGNS 6'-0' IN HEIGHT AND SMALLER. THE MINIMUM SHEET WIDTH IS 1'-6".

SIGNS OVER 6'-0" HIGH MAY HAVE HORIZONTAL AND VERTICAL JOINTS. THE MINIMUM SHEET SIZE IS 1'-6" WIDE BY 1'-6" HIGH.

CLEAN AND DRY POST CLIP NUTS, THEN TORQUE TO 225 INCH POUNDS.

LOCATE ALL HORIZONTAL JOINTS AT A "T"-SECTION.

NO SPLICES ARE ALLOWED IN EXTRUDED "T"-SECTIONS.

USE SCREWS, BOLTS AND LOCKWASHERS THAT ARE ALUMINUM ALLOY MEETING ASTM B 211 FOR ALLOY 2024-T4, STAINLESS STEEL, OR CADMIUM PLATED STEEL MEETING ASTM B 766.

USE ONLY ALUMINUM RIVETS.

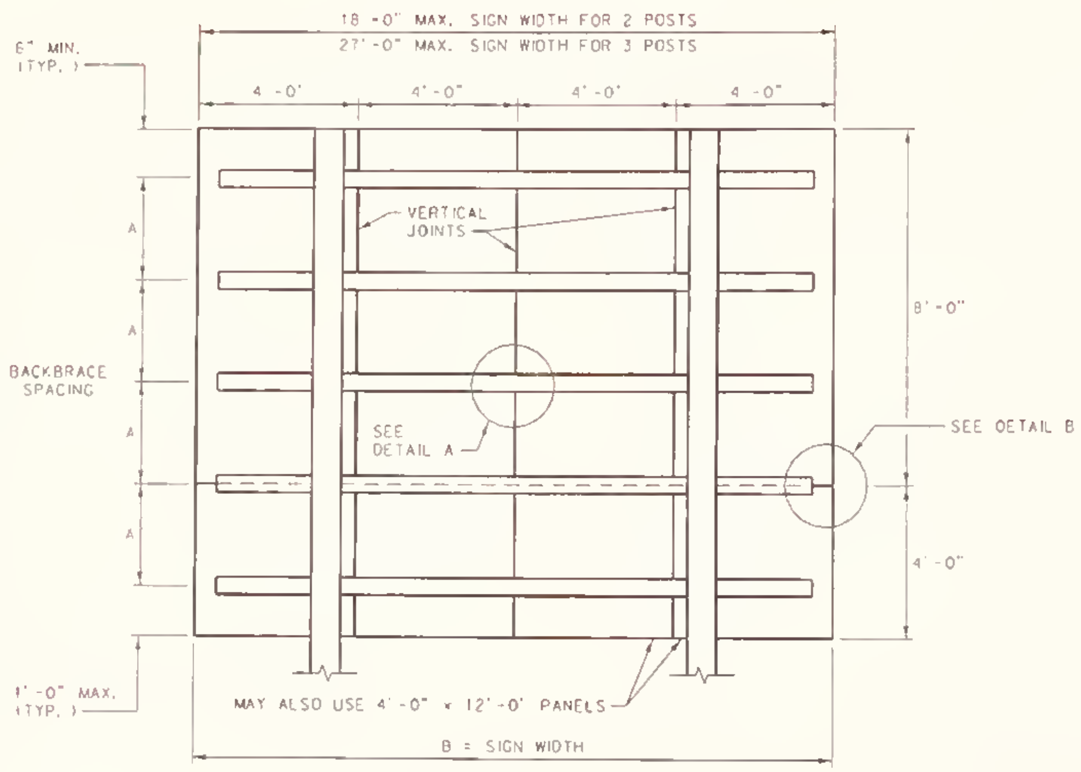
THE MAXIMUM GAP BETWEEN INDIVIDUAL SIGN PANELS AT JOINTS IS $\frac{1}{16}$" AT ANY POINT.

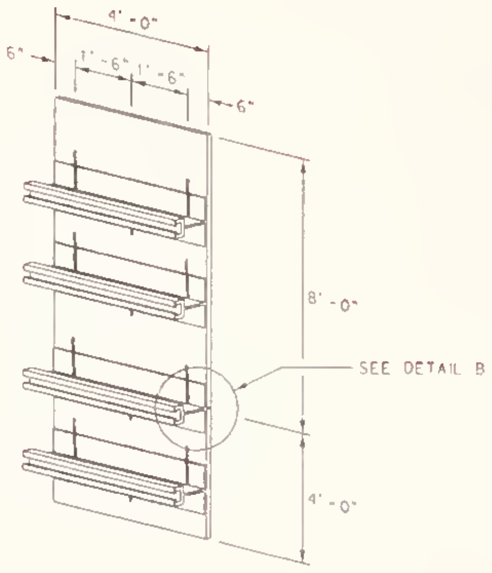
THE ENGINEER MAY APPROVE ADDITIONAL METHODS TO PREVENT LIGHT LEAKAGE THROUGH SIGN PANEL SEAMS.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 619, 704
DWG. NO.
619-04

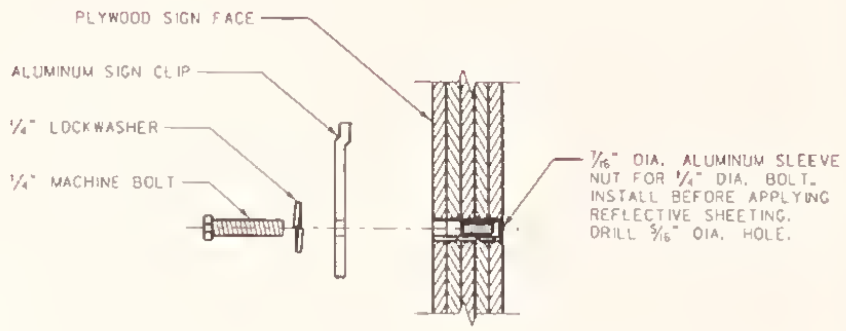
ALUMINUM SHEET
INCREMENT SIGN
CONSTRUCTION DETAILS

EFFECTIVE: AUGUST 1999
MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



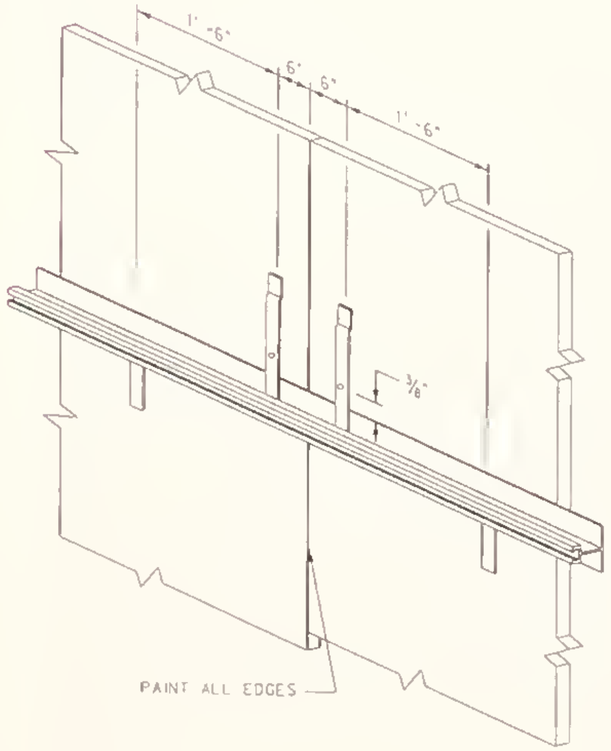


ALUMINUM CLIP PLACEMENT

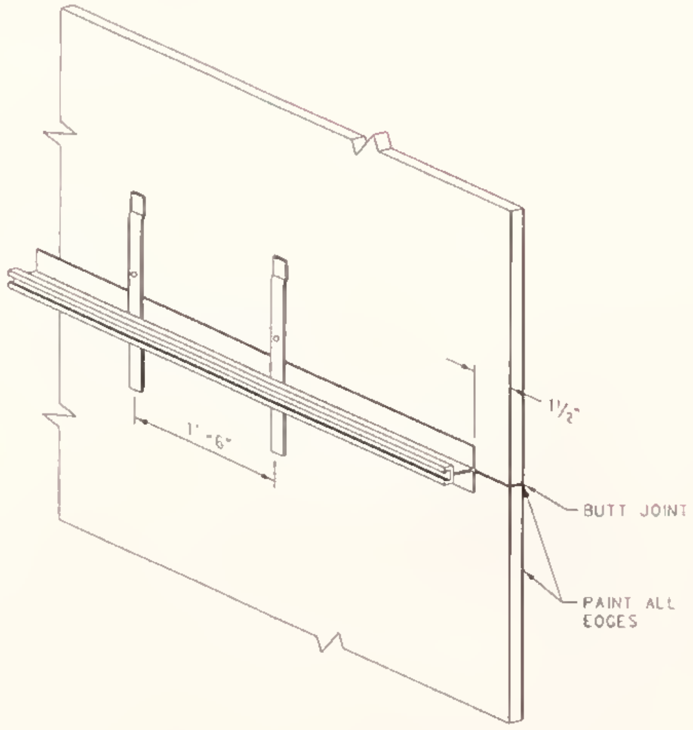

PLYWOOD SIGN FACE
ALUMINUM SIGN CLIP
¼" LOCKWASHER
¼" MACHINE BOLT
7/16" DIA. ALUMINUM SLEEVE NUT FOR ¼" DIA. BOLT. INSTALL BEFORE APPLYING REFLECTIVE SHEETING. DRILL 5/16" DIA. HOLE.

CLIP DETAIL

BACKBRACING TABLE - PLYWOOD SIGNS		
MAXIMUM BACKBRACE SPACING "A"	MAXIMUM WIDTH "B"	
	2 POST	3 POST
1'-8"	18'-0"	27'-0"
1'-10"	17'-0"	25'-8"
2'-0"	16'-6"	24'-8"
2'-6"	14'-9"	22'-0"
3'-0"	13'-6"	20'-0"
3'-6"	12'-6"	18'-6"



DETAIL A
VERTICAL JOINT



DETAIL B
HORIZONTAL JOINT

NOTES:

CONFORM ALL PLYWOOD SIGNS TO SECTIONS 619, 704.01.3 AND 704.02.2 OF THE STANDARD SPECIFICATIONS.

ON SIGNS 4'-0" HIGH AND GREATER, DO NOT USE ANY PANELS LESS THAN 4'-0" IN HEIGHT.

DO NOT USE HORIZONTAL JOINTS ON SIGNS LESS THAN 4'-0" IN HEIGHT.

FOR SIGNS WITH WIDTHS THAT ARE NOT IN MULTIPLES OF 4'-0", PLACE THE ODD LENGTH PANEL ON THE INSIDE EDGE.

FOR SIGNS OVER 10'-0" IN HEIGHT, THE FULL HEIGHT MAY BE OBTAINED WITH PANELS HAVING A FACTORY SCARFED JOINT IN LIEU OF USING STANDARD LENGTH PANEL AS SHOWN.

THE MINIMUM SIZE PANEL IS 1'-6" WIDE BY 4'-0" HIGH.

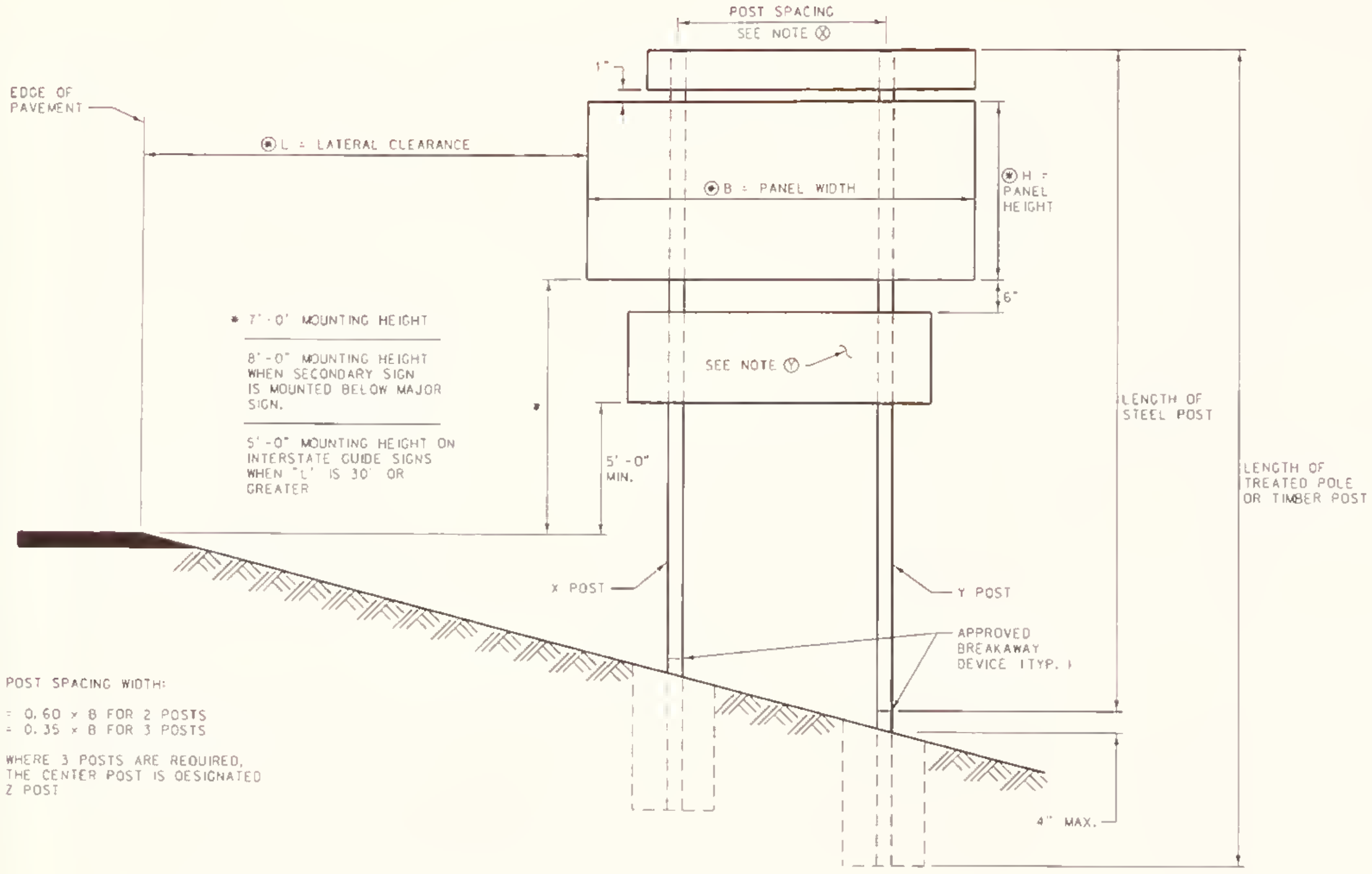
CONSTRUCT PLYWOOD SIGNS OF ONE PIECE OF PLYWOOD UNLESS THE PLANS SPECIFY OTHERWISE FOR SPECIAL DESIGN SIGNS.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 619, 704
DWG. NO.
619-06

PLYWOOD SHEET INCREMENT
GUIDE SIGN
CONSTRUCTION DETAILS

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD


POST SPACING
SEE NOTE ⊗
1"
EDGE OF PAVEMENT
⊙ L = LATERAL CLEARANCE
⊙ B = PANEL WIDTH
⊙ H = PANEL HEIGHT
6"
* 7'-0" MOUNTING HEIGHT
8'-0" MOUNTING HEIGHT WHEN SECONDARY SIGN IS MOUNTED BELOW MAJOR SIGN.
5'-0" MOUNTING HEIGHT ON INTERSTATE GUIDE SIGNS WHEN "L" IS 30' OR GREATER
*
SEE NOTE Ⓨ
5'-0" MIN.
LENGTH OF STEEL POST
LENGTH OF TREATED POLE OR TIMBER POST
X POST
Y POST
APPROVED BREAKAWAY DEVICE (TYP.)
4" MAX.

⊗ POST SPACING WIDTH:

= 0.60 × B FOR 2 POSTS
= 0.35 × B FOR 3 POSTS

WHERE 3 POSTS ARE REQUIRED, THE CENTER POST IS DESIGNATED Z POST

NOTES:

MOUNTING SYSTEMS SHOWN ARE TYPICAL. OTHER SYSTEMS MAY BE APPROVED BY THE ENGINEER.

ALL STEEL HARDWARE MUST BE GALVANIZED, STAINLESS, OR CADMIUM PLATED.

GAIN THE TOP HALF OF WOOD POLES ACCORDING TO THE TABLE ON DTL. DWG. NO. 619-20.

SEE THE SIGNING QUANTITIES FOR THE TYPES OF POSTS AND FOUNDATIONS.

MOUNT ONE-PANEL PLYWOOD SIGNS DIRECTLY TO WOOD POLES OR POSTS, WHEN SPECIFIED IN THE PLANS, BY BOLTING THROUGH THE SIGN PLATE AND THE POLE WITH CADMIUM PLATED BOLTS AS REQUIRED BY THE DETAILED DRAWINGS, SPECIFICATIONS AND DESIGN. USE "T"-SECTION WIND BEAMS WHEN REQUIRED BY DTL. DWG. NO. 619-06.

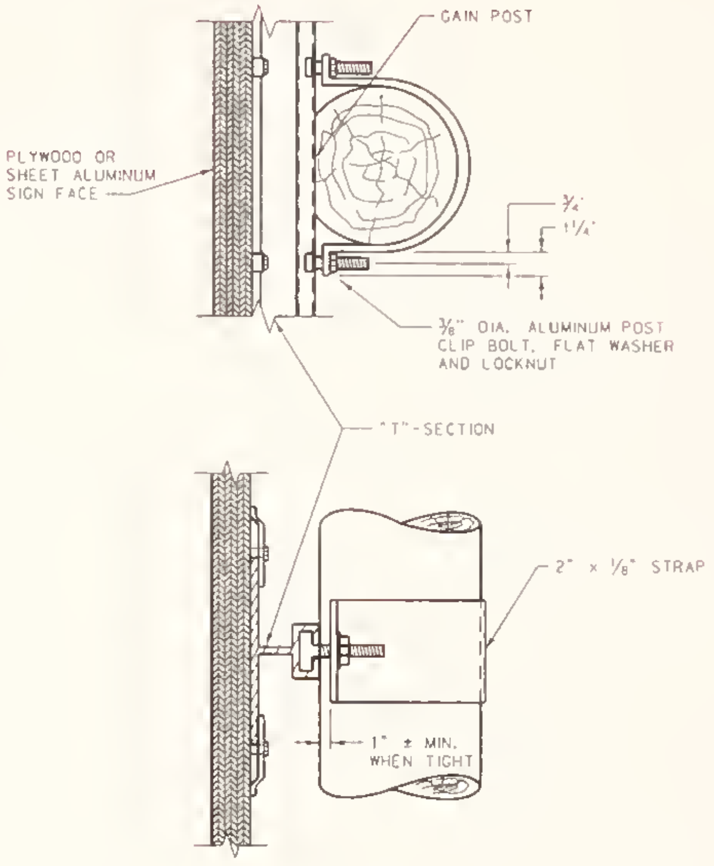
Ⓨ SUSPEND LARGE SUPPLEMENTAL SIGNS, ADDED AFTER INITIAL SIGN INSTALLATION, FROM MAJOR SIGN PANEL OR BACKBRACING. ATTACHMENT TO MULTIPLE POSTS/POLES IS NOT ALLOWED.

USE POST SPACING, POST SIZE AND BREAKAWAY DEVICES SPECIFIED IN THE PLANS AND IN THE SPECIFICATIONS. FOR INFORMATION REGARDING APPROPRIATE BREAKAWAY DEVICES FOR NEW INSTALLATIONS NOT SUPPORTED BY THE PLANS, CONTACT THE TRAFFIC UNIT.

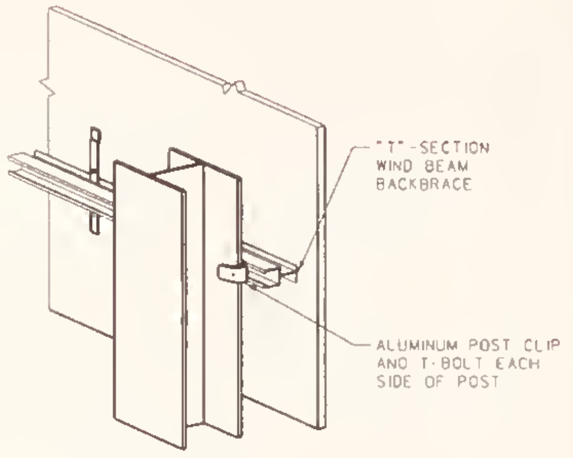
IN LOCATING SIGNS, AVOID PLACING POSTS IN DITCH BOTTOMS WHERE THEY WOULD IMPEDE DRAINAGE.

⊙ DIMENSIONS ARE SPECIFIED IN THE SIGNING PLANS.

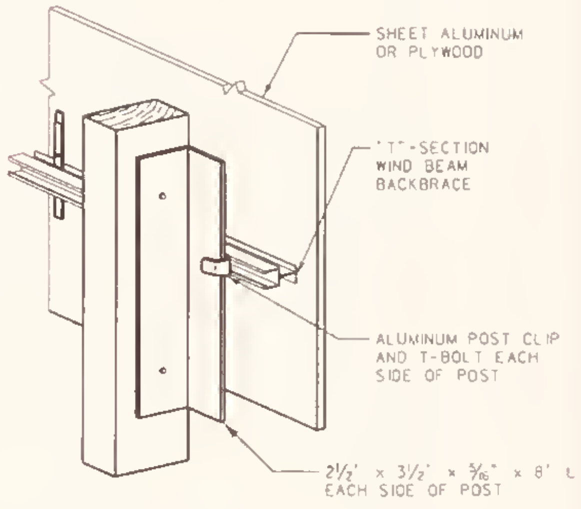
MOUNTING DETAILS


GAIN POST
PLYWOOD OR SHEET ALUMINUM SIGN FACE
¾"
1¼"
⅜" DIA. ALUMINUM POST CLIP BOLT, FLAT WASHER AND LOCKNUT
"T"-SECTION
2" × ⅛" STRAP
1" ± MIN. WHEN TIGHT

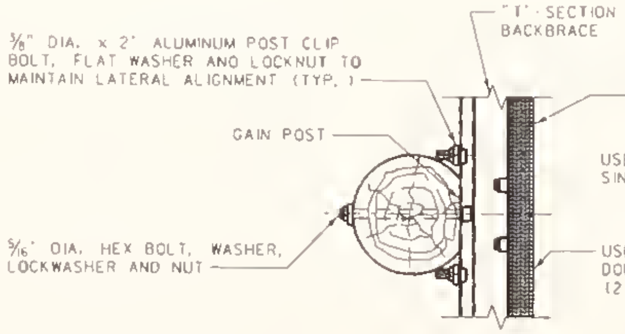
TREATED POLE


"T"-SECTION WIND BEAM BACKBRACE
ALUMINUM POST CLIP AND T-BOLT EACH SIDE OF POST

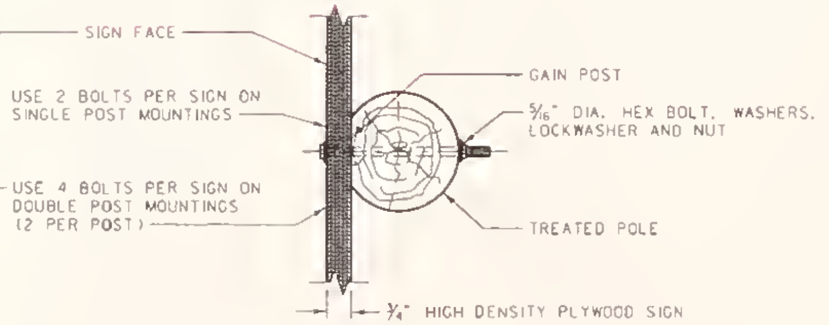
STEEL POST


SHEET ALUMINUM OR PLYWOOD
"T"-SECTION WIND BEAM BACKBRACE
ALUMINUM POST CLIP AND T-BOLT EACH SIDE OF POST
2½" × 3½" × 5⁄16" × 8" L EACH SIDE OF POST

TREATED TIMBER POST


⅜" DIA. × 2" ALUMINUM POST CLIP BOLT, FLAT WASHER AND LOCKNUT TO MAINTAIN LATERAL ALIGNMENT (TYP.)
"T"-SECTION BACKBRACE
GAIN POST
5⁄16" DIA. HEX BOLT, WASHER, LOCKWASHER AND NUT

DOUBLE POLE MOUNT


SIGN FACE
GAIN POST
USE 2 BOLTS PER SIGN ON SINGLE POST MOUNTINGS
5⁄16" DIA. HEX BOLT, WASHERS, LOCKWASHER AND NUT
USE 4 BOLTS PER SIGN ON DOUBLE POST MOUNTINGS (2 PER POST)
TREATED POLE
¾" HIGH DENSITY PLYWOOD SIGN

TREATED POLE
SINGLE OR DOUBLE
(USED WHEN "T"-BAR WIND BEAMS NOT REQUIRED)

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 619.704
DWG. NO.
619-08

GUIDE SIGN CLEARANCE
AND MOUNTING DETAILS

EFFECTIVE: AUGUST 1999
MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

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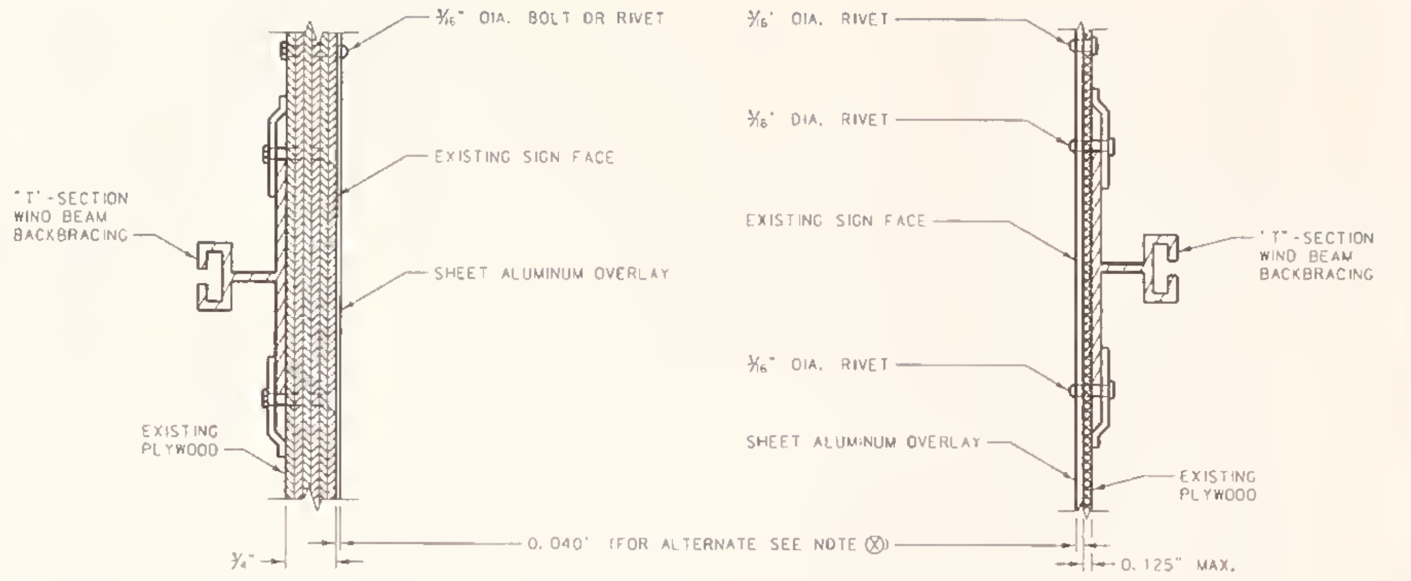
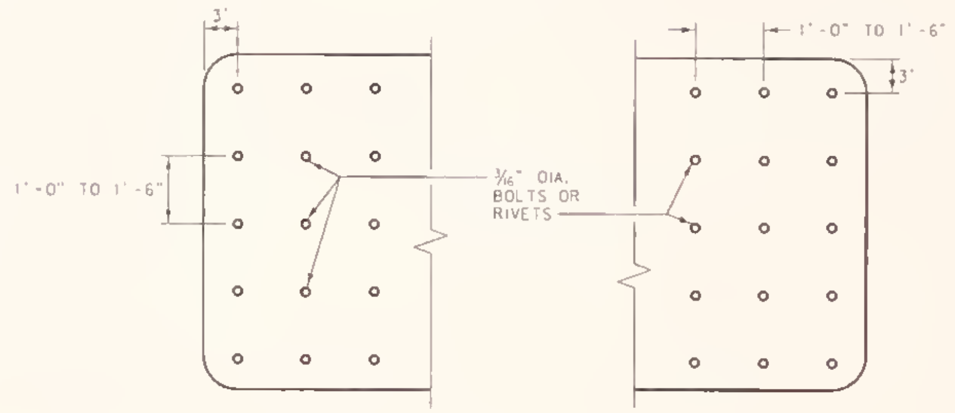


EXISTING PLYWOOD SIGNS

EXISTING ALUMINUM SIGNS



FASTENER PATTERN

NOTES:

REMOVE ALL RAISED LETTERS, NUMERALS, SYMBOLS, BORDERS AND PREVIOUS SIGN OVERLAYS TO BE REPLACED, AND CLEAN SIGN FACE TO A SMOOTH SURFACE BEFORE OVERLAYING.

ALL LETTERS, NUMERALS, SYMBOLS AND BORDERS ARE TYPE "C" CUTOUT UNLESS OTHERWISE SPECIFIED, AND APPLIED TO THE BACKGROUND SHEETING PRIOR TO FIELD APPLICATION OF THE SIGN.

THE SIZE OF ALL GUIDE SIGN OVERLAYS AND LEGENDS MUST BE VERIFIED BY THE ENGINEER PRIOR TO FABRICATION.

⊗ AN ADHESIVE-BACKED SHEETING MAY BE USED AS AN ALTERNATIVE ON SIGN WIDTHS OF 6'-0" OR LESS IF IT IS PREFABRICATED TO A MINIMUM THICKNESS OF 0.005 INCHES AND CONSTRUCTED OF PREAPPLIED REFLECTIVE SHEETING ON ADHESIVE-BACKED ALUMINUM. APPLY ADHESIVE-BACKED OVERLAY SHEETING WHEN AIR AND SURFACE TEMPERATURES ARE ABOVE 50°F (10°C). DO NOT USE THIS TYPE OF OVERLAY MATERIAL ON OVERHEAD SIGNS.

PROVIDE A MINIMUM REFLECTIVE SHEETING INTENSITY OF ENGINEERING GRADE, MEETING THE REQUIREMENTS OF THE STANDARD SPECIFICATIONS, UNLESS SPECIFIED OTHERWISE.

APPLY ALL MATERIALS IN ACCORDANCE WITH THE MANUFACTURER'S SPECIFICATIONS AND RECOMMENDATIONS.

SEE THE STANDARD SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

USE ALUMINUM ALLOY TYPE 6061-T6 OR AA5052-H38. CONVERSION COAT ALL ALUMINUM WITH A PROCESS SUCH AS ALODINE 1200 (OR EQUAL), AND RINSE AND DRY THOROUGHLY. PROTECT IT FROM SOIL BY ACCEPTABLE METHODS.

SIGN OVERLAYS MAY REQUIRE REMOVAL OF THE SIGN FROM THE POSTS TO AVOID PROJECTING BOLT HEADS. DO NOT LEAVE WARNING AND REGULATORY SIGNS TO BE OVERLAYED UNDISPLAYED FOR MORE THAN ONE (1) HOUR DURING DAYLIGHT. DO NOT LEAVE GUIDE SIGNS UNDISPLAYED FOR MORE THAN TEN (10) HOURS DURING DAYLIGHT. INSURE SIGNS TO BE OVERLAYED ARE OPERATIONAL PRIOR TO DARKNESS.

OVERLAY SIGNS SMALLER THAN 4'-0" x 6'-0" WITH ONE PANEL OF MATERIAL. FOR SEAMS IN LARGE OVERLAYS, USE RIVETS OR BOLTS SPACED AS SHOWN ON THIS DRAWING AND PLACE PARALLEL TO AND NO MORE THAN 3" LATERALLY FROM THE SEAM.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 619
DWG. NO.
619-10

SHEET ALUMINUM OVERLAY

EFFECTIVE: AUGUST 1999

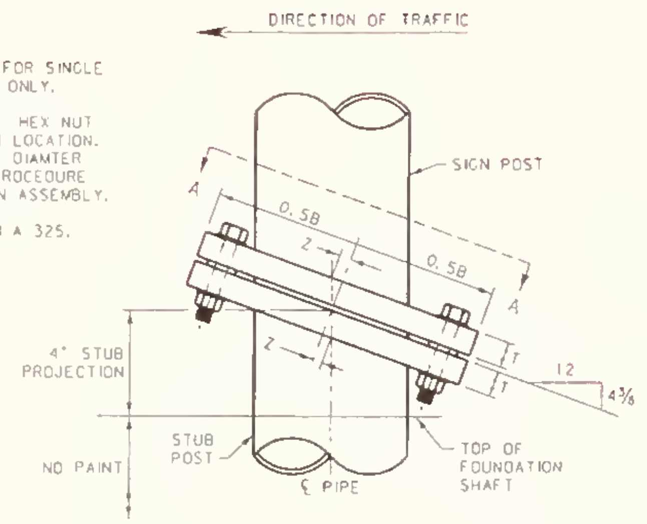
MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

NOTES:

USE TUBULAR POSTS FOR SINGLE POST MOUNTED SIGNS ONLY.

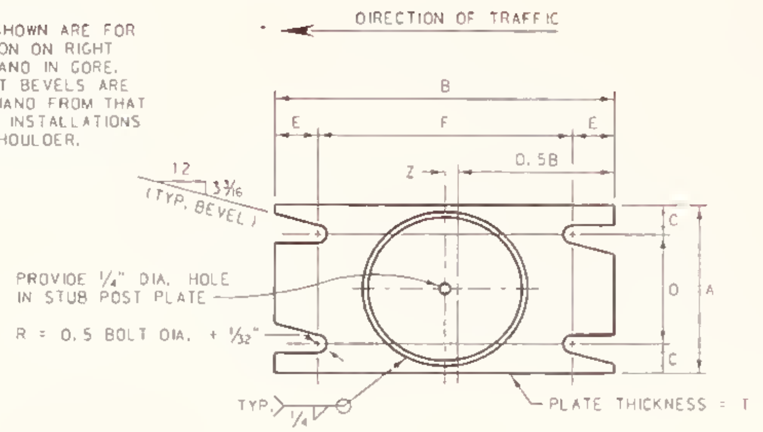
BOLT WITH HEX HEAD, HEX NUT AND 3 WASHERS EACH LOCATION. SEE TABLE FOR BOLT DIAMTER AND TORQUE. SEE PROCEDURE FOR BASE CONNECTION ASSEMBLY.

ALL BOLTS ARE ASTM A 325.



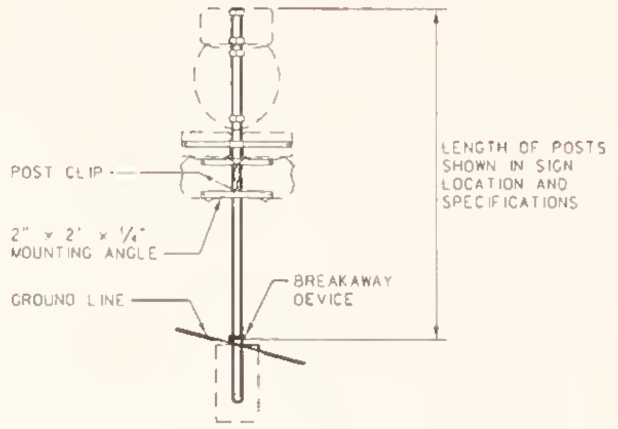
SIGN POST AND STUB POST DETAILS

SECTIONS SHOWN ARE FOR INSTALLATION ON RIGHT SHOULDER AND IN GORE. PLATE SLOT BEVELS ARE OPPOSITE HAND FROM THAT SHOWN FOR INSTALLATIONS ON LEFT SHOULDER.



SECTION A-A

BASE PLATE DETAIL

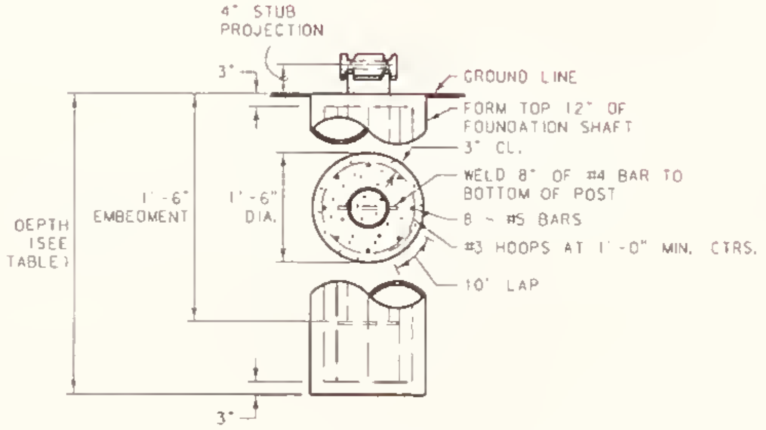

POST CLIP
2" × 2' × ¼" MOUNTING ANGLE
GROUND LINE
BREAKAWAY DEVICE
LENGTH OF POSTS SHOWN IN SIGN LOCATION AND SPECIFICATIONS

TYPICAL SIGN ELEVATION

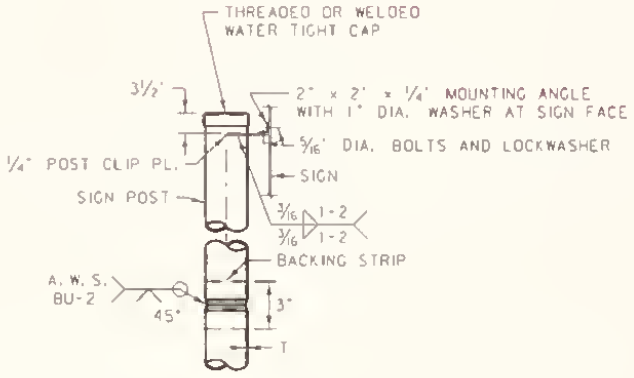
FOR DETAILS OF MOUNTING ANGLES SEE DETAILED DRAWING NUMBER 619-16 AND BELOW.

PROCEDURE FOR BASE CONNECTION ASSEMBLY

1. ASSEMBLE POST TO STUB WITH BOLTS AND ONE FLAT WASHER BETWEEN PLATES.
2. SHIM AS REQUIRED TO PLUMB POST.
3. TIGHTEN BOLTS IN A SYSTEMATIC ORDER TO THE PRESCRIBED TORQUE (SEE TABLE BELOW).
4. LOOSEN EACH BOLT AND RETIGHTEN TO PRESCRIBED TORQUE IN THE SAME ORDER AS ORIGINAL TIGHTENING. DO NOT OVERTIGHTEN.
5. BURR THREADS AT JUNCTION WITH NUT USING A CENTER PUNCH TO PREVENT NUT LOOSENING.

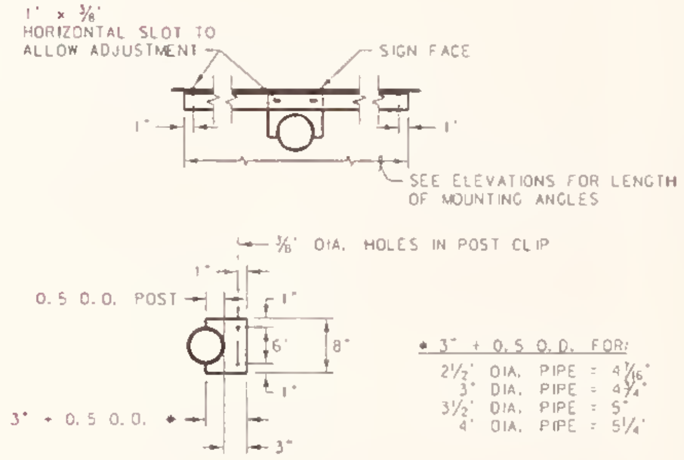


FOUNDATION SHAFT DETAIL

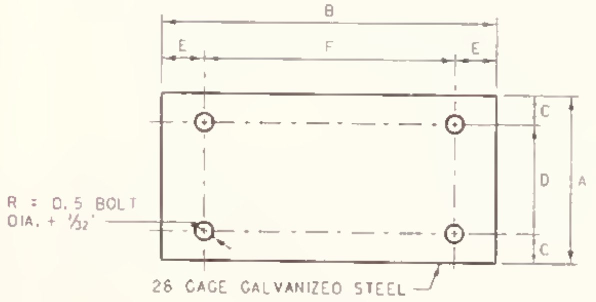

THREADED OR WELDED WATER TIGHT CAP
3½"
2" × 2' × ¼' MOUNTING ANGLE WITH 1" DIA. WASHER AT SIGN FACE
5/16' DIA. BOLTS AND LOCKWASHER
¼" POST CLIP PL.
SIGN
SIGN POST
3/16 1-2
3/16 1-2
BACKING STRIP
A.W.S. BU-2
45°
3"
T

TYPICAL SPLICE

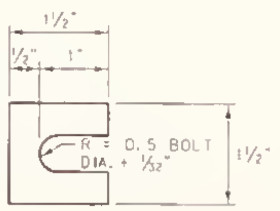
BACKING STRIP THICKNESS = T OR 3/16" MAX. LOCATE SPLICE IN TOP ONE-HALF OF POST.



POST CLIP DETAILS



KEEPER PLATE DETAIL



FURNISH TWO 0.012" ± THICK AND TWO 0.032' ± THICK SHIMS PER POST. USE SHIMS FABRICATED FROM BRASS SHIM STOCK OR STRIP CONFORMING TO ASTM B 36.

SHIM DETAIL

TABLE OF WEIGHTS		
NOMINAL PIPE DIA.	NOMINAL WEIGHT (LB./FT.) OF PIPE	WEIGHT OF EACH BREAKAWAY DEVICE & STUB POST (LB.)
3"	7.58	28.03
3½'	9.11	35.85
4"	10.79	38.44
5'	14.62	61.51
6"	18.97	81.54

NOTES:

USE STEEL PIPE CONFORMING TO THE REQUIREMENTS OF ASTM A 53, TYPE E OR S, GRADE B OR A 500, GRADE B.

USE CLASS "A" OR "D" CONCRETE WITH A WOOD FLOAT FINISH ON TOP. FORM TOP TWELVE INCHES OF FOUNDATION.

SEE THE STANDARD SPECIFICATIONS FOR REQUIREMENTS GOVERNING STRUCTURAL STEELS AND THEIR FABRICATION.

SUBMIT SHOP PLANS FOR APPROVAL PRIOR TO FABRICATION.

FOR SIGN PLACEMENT AND DETAILS SEE THE SIGNING DETAILED DRAWINGS.

GALVANIZE PIPE AS PER AASHTO M 111.

EXCEPT AS OTHERWISE APPROVED BY THE ENGINEER, PAINT STRUCTURAL STEEL WITH ONE SHOP COAT AND ONE FIELD COAT OF ZINC RICH BASED PAINT AND ONE FIELD COAT OF ALUMINUM PAINT AS SPECIFIED IN THE STANDARD SPECIFICATIONS, ON ALL SURFACES NOT IN CONTACT WITH THE CONCRETE.

FRANGIBLE BOLT BREAKAWAY SYSTEMS APPROVED BY FHWA ARE ALLOWED TO BE USED IN PLACE OF THE DESIGN SHOWN HERE AS AN EQUAL OPTION (PER ENGINEER'S APPROVAL).

BASE CONNECTION DATA											FOUNDATION	
NOMINAL PIPE DIA.	BOLT SIZE	BOLT TORQUE	A	B	C	D	E	F	T	Z	FOOTING DIAMETER	FOOTING DEPTH
3"	½" DIA. × 2½"	240 IN. LB.	4½"	7½"	1"	2½'	¾'	6'	¾'	5/16"	1'-6'	3'-0"
3½' & 4"	½" DIA. × 2½"	240 IN. LB.	5½"	8½"	1"	3½"	¾'	7"	¾"	5/16"	1'-6"	3'-0"
5"	⅝' DIA. × 3¼"	480 IN. LB.	6½"	9¾"	1¼'	4'	⅞'	8'	1"	⅜"	1'-6'	4'-0"
6"	¾' DIA. × 3½"	780 IN. LB.	7½"	11¼"	1¼"	5"	1"	9¼"	1"	⅜"	1'-6'	4'-6"

DETAILED DRAWING

REFERENCE
STANDARD SPEC.
SECTION 556, 619, 704

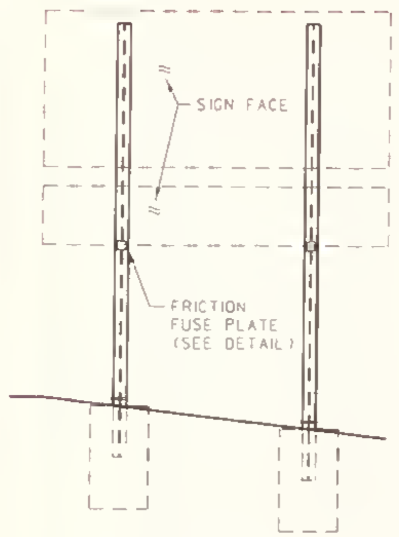
DWG. NO.
619-12

TUBULAR SIGN POST DETAILS

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION

MONTANA CADD



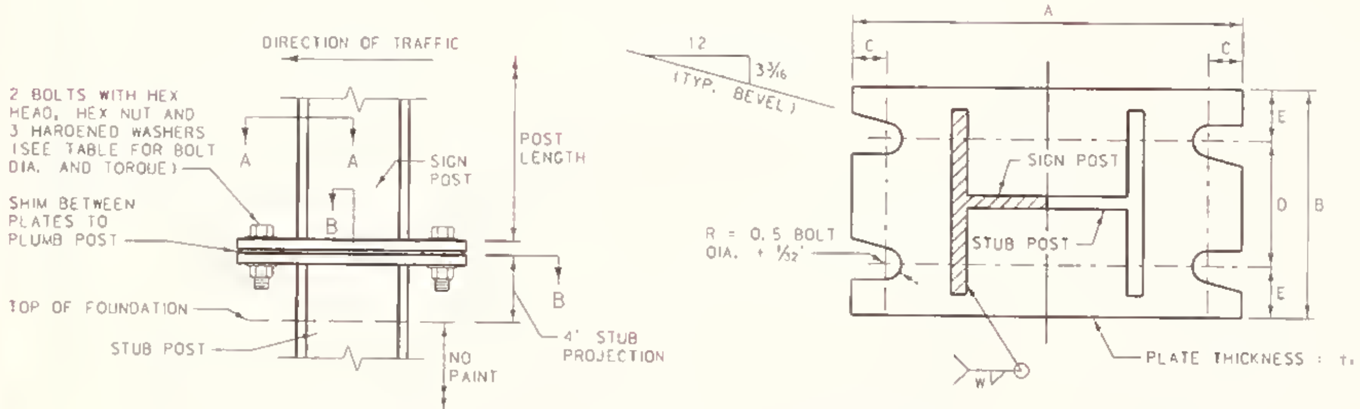
TYPICAL SIGN ELEVATION

BASE CONNECTION DATA											FUSE PLATE DATA										FOUNDATION DATA				
POST SIZE	BOLT SIZE	BOLT TORQUE	DIMENSIONS							BREAKAWAY DEVICE (LB.)	DIMENSIONS								BOLT DIA.	FUSE DEVICE (LB.)	FTG. DEPTH	STUB LENGTH	FTG. DIA.	BAR C SIZE	STUB POST (LB.)
			A	B	C	D	E	t_1	W		F	G	H	J	K	L	N	t_3							
W4 × 13 M4 × 13	⅝" DIA. × 2¾"	40 FT. LB.	8½"	5"	¾"	2¾"	1⅛"	¾"	5/16"	21.58	3¾"	2"	1⅛"	4"	2¼"	⅞"	⅝"	⅜"	⅝"	1.60	3'-6"	2'-0"	1'-6"	#5	26.00
W8 × 18			12½"	6¼"	¾"	4"	1⅛"	¾"	5/16"	37.00	4½"	2½"	1¼"	5¼"	2¾"	1¼"	¾"	½"	¾"	3.27	5'-6"	2'-6"	2'-0"	#7	45.00
W8 × 24	¾" DIA. × 3½"	65 FT. LB.	13"	7½"	¾"	5"	1¼"	1"	5/16"	60.86	4¾"	2½"	1½"	6"	3½"	1¼"	¾"	9/16"	¾"	4.66	7'-0"	3'-0"	2'-0"	#9	72.00
W12 × 30			17"	7½"	⅞"	5"	1¼"	1"	5/16"	78.54	5⅜"	3"	1½"	6½"	3½"	1½"	⅞"	9/16"	⅞"	5.42	8'-0"	3'-0"	2'-6"	#9	90.00
S3 × 5.7	½" DIA. × 2½"	20 FT. LB.	8"	3"	¾"	1½"	¾"	⅝"	¼"	10.37	3⅛"	1½"	1⅛"	2⅝"	1½"	9/16"	½"	¼"	½"	0.64	3'-6"	1'-6"	1'-6"	#4	8.55
S4 × 7.7			8"	3"	¾"	1½"	¾"	⅝"	¼"	10.45	3⅛"	1½"	1⅛"	2⅝"	1½"	9/16"	½"	¼"	½"	0.64	3'-6"	1'-6"	1'-6"	#4	11.55
S5 × 10.0	⅝" DIA. × 2¾"	40 FT. LB.	9½"	4"	¾"	2"	1"	¾"	¼"	19.08	3⅛"	1½"	1⅛"	3"	1⅞"	9/16"	½"	¼"	½"	0.66	3'-6"	1'-6"	1'-6"	#5	15.00

PROCEDURE FOR BASE CONNECTION ASSEMBLY

1. ASSEMBLE POST TO STUB WITH BOLTS AND ONE FLAT WASHER BETWEEN PLATES.
2. SHIM AS REQUIRED TO PLUMB POST.
3. TIGHTEN BOLTS IN A SYSTEMATIC ORDER TO THE PRESCRIBED TORQUE (SEE TABLE).
4. LOOSEN EACH BOLT AND RETIGHTEN TO PRESCRIBED TORQUE IN THE SAME ORDER AS ORIGINAL TIGHTENING. DO NOT OVERTIGHTEN.
5. BURR THREADS AT JUNCTION WITH NUT USING A CENTER PUNCH TO PREVENT NUT LOOSENING.

NOTE:
ALL BOLTS MUST BE ASTM A 325 AND BE TIGHTENED BY USE OF A DIRECT TENSION INDICATING DEVICE (LOAD INDICATING WASHER) IN ACCORDANCE WITH THE MANUFACTURER'S SPECIFICATIONS.



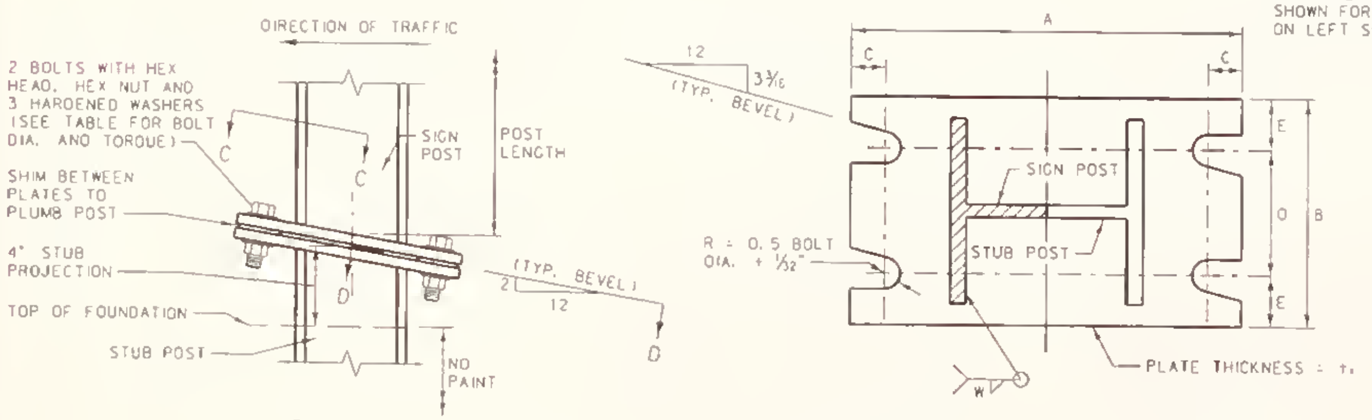
ELEVATION

SECTION A-A

SECTION B-B

SIGN POST AND STUB POST DETAIL "A"

NOTE:
SECTIONS SHOWN ARE FOR INSTALLATIONS ON RIGHT SHOULDER AND IN GORE. PLATE SLOT BEVELS ARE OPPOSITE HAND FROM THAT SHOWN FOR INSTALLATIONS ON LEFT SHOULDER.

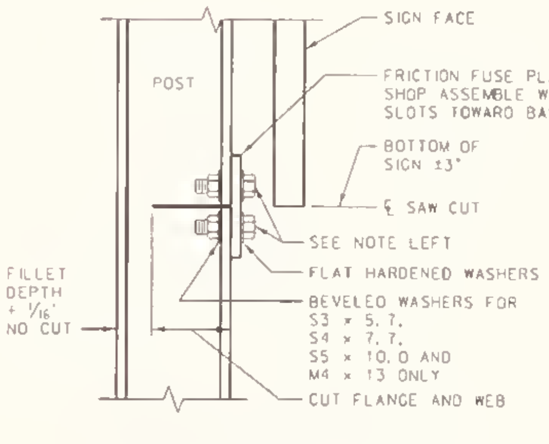


ELEVATION

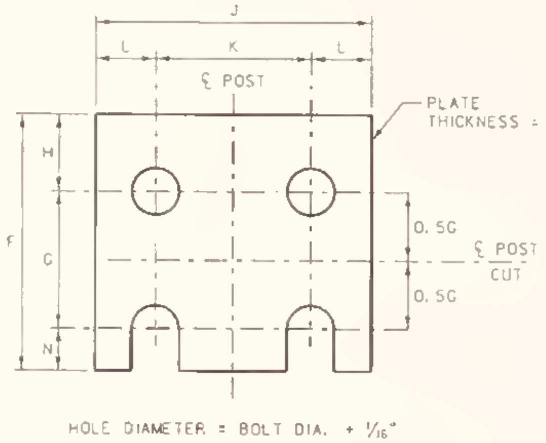
SECTION C-C

SECTION D-D

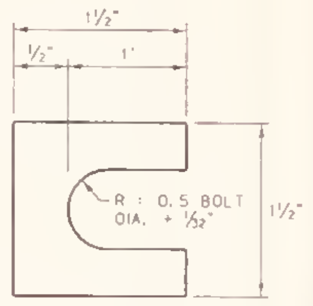
SIGN POST AND STUB POST DETAIL "B"
USE ONLY WITH SINGLE POST SIGNS


POST
SIGN FACE
FRICTION FUSE PLATE, SHOP ASSEMBLE WITH SLOTS TOWARD BASE
BOTTOM OF SIGN ±3"
℄ SAW CUT
SEE NOTE LEFT
FLAT HARDENED WASHERS
BEVELED WASHERS FOR S3 × 5.7, S4 × 7.7, S5 × 10.0 AND M4 × 13 ONLY
CUT FLANGE AND WEB
FILLET DEPTH + 1/16" NO CUT

FRICTION FUSE PLATE DETAIL
DO NOT USE ON SINGLE POST SIGNS

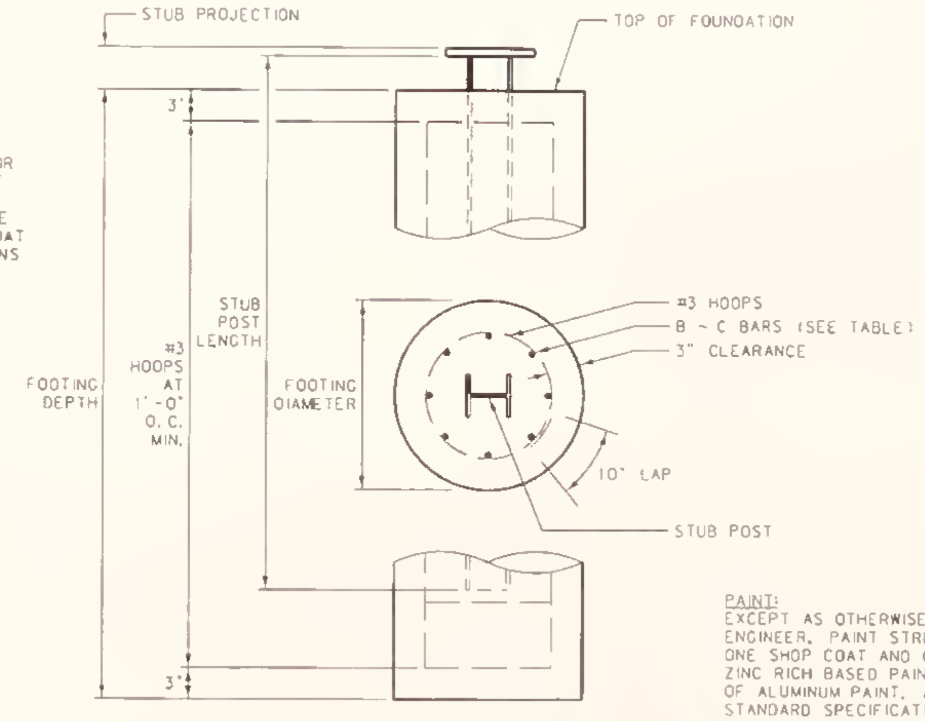


FRICTION FUSE PLATE DETAIL



FURNISH TWO 0.012" ± THICK AND TWO 0.032" ± THICK SHIMS PER POST. USE SHIMS FABRICATED FROM BRASS SHIM STOCK OR STRIP CONFORMING TO ASTM B 36.

SHIM DETAIL



FOUNDATION DETAIL

NOTES:

USE CLASS "A" OR "D" CONCRETE WITH A WOOD FLOAT FINISH ON TOP. FORM TOP 12 INCHES OF FOUNDATION.

SEE THE STANDARD SPECIFICATIONS FOR REQUIREMENTS GOVERNING STRUCTURAL STEELS AND THEIR FABRICATIONS. TO AVOID OVERSIGHT, NOTE THESE REQUIREMENTS ON THE SHOP DRAWINGS.

SUBMIT SHOP PLANS FOR APPROVAL BEFORE FABRICATION IS BEGUN.

THE WEIGHT OF STEEL POSTS IS COMPUTED BY TAKING THE LENGTH OF THE POST TIMES THE NOMINAL WEIGHT PER FOOT PLUS THE WEIGHT OF THE BREAKAWAY DEVICE, FUSE DEVICE AND STUB POST AS SHOWN IN THE TABLE.

FOR GUIDE SIGN PLACEMENT AND DETAILS, SEE SIGNING DTL. DWG. NO. 619-08.

FRANGIBLE BOLT BREAKAWAY SYSTEMS APPROVED BY FHWA ARE ALLOWED TO BE USED IN PLACE OF THE DESIGN SHOWN HERE AS AN EQUAL OPTION (PER ENGINEER'S APPROVAL).

PAINT:
EXCEPT AS OTHERWISE APPROVED BY THE ENGINEER, PAINT STRUCTURAL STEEL WITH ONE SHOP COAT AND ONE FIELD COAT OF ZINC RICH BASED PAINT AND ONE FIELD COAT OF ALUMINUM PAINT, AS SPECIFIED IN THE STANDARD SPECIFICATIONS, ON ALL SURFACES NOT IN CONTACT WITH CONCRETE.

DETAILED DRAWING
REFERENCE DWG. NO.
STANDARD SPEC. SECTION 619
619-13

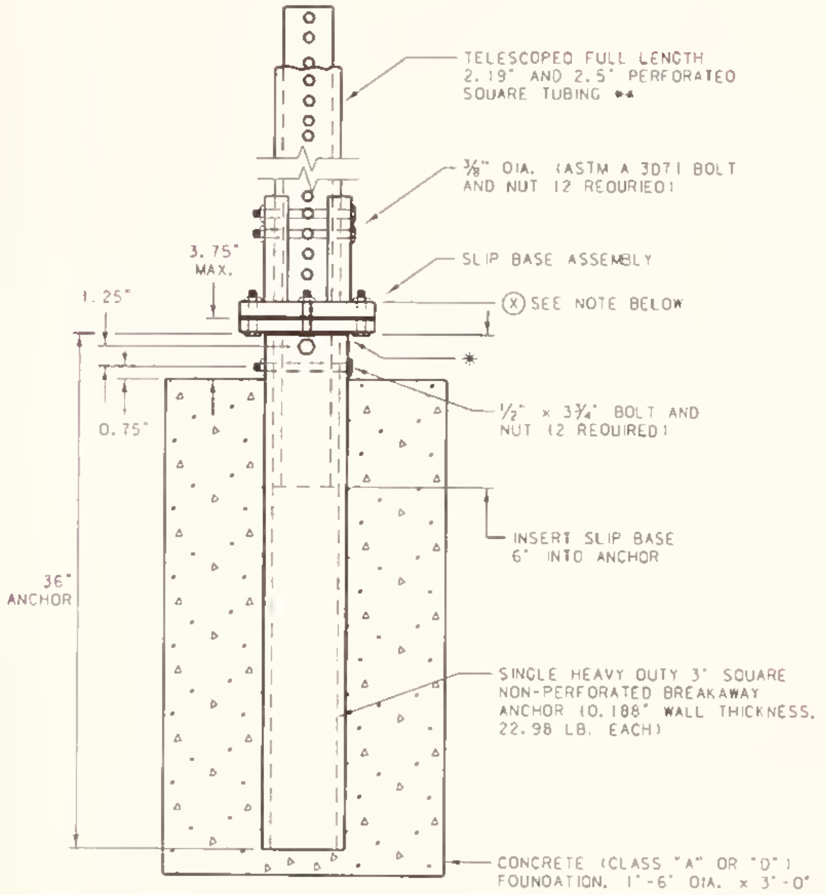
BREAKAWAY AND FOUNDATION
DETAILS FOR MULTIPLE
GUIDE SIGN SUPPORTS

EFFECTIVE: AUGUST 1999

MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

TELESCOPED SQUARE TUBES SIGN POST INSTALLATION ON SLIP BASE

AS NOTED BY THE STAR SYMBOL ★ ON THE LOCATION AND SPECIFICATION SHEETS.

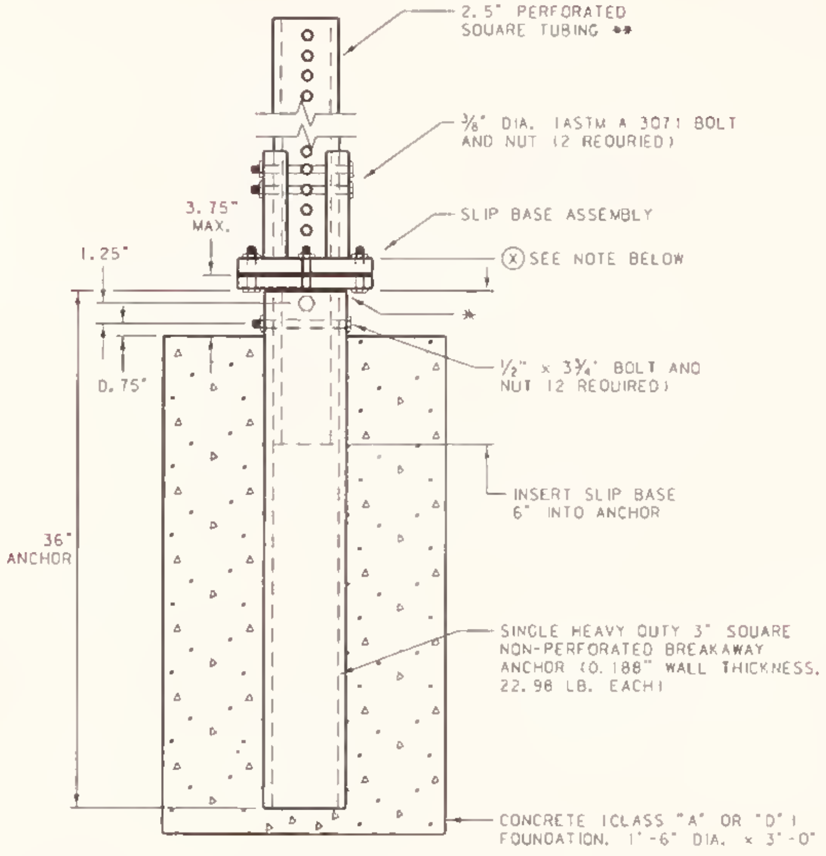

TELESCOPED FULL LENGTH 2.19" AND 2.5" PERFORATED SQUARE TUBING **
3/8" DIA. (ASTM A 307) BOLT AND NUT (2 REQUIRED)
3.75" MAX.
SLIP BASE ASSEMBLY
1.25"
ⓧ SEE NOTE BELOW
*
1/2" × 3 3/4" BOLT AND NUT (2 REQUIRED)
0.75"
INSERT SLIP BASE 6" INTO ANCHOR
36" ANCHOR
SINGLE HEAVY DUTY 3" SQUARE NON-PERFORATED BREAKAWAY ANCHOR (0.188" WALL THICKNESS, 22.98 LB. EACH)
CONCRETE (CLASS "A" OR "D") FOUNDATION, 1'-6" DIA. × 3'-0"

* MINIMUM OF 2 SHIMS REQUIRED PER INSTALLATION TO TAKE UP TOLERANCE BETWEEN SLIP BASE STUB AND FOUNDATION ANCHOR.

** SUPPORT		
TUBE SIZE	WEIGHT	WALL THICKNESS
2.19"	3.45 LB./FT.	0.135" (10 GAGE)
2.50"	3.80 LB./FT.	0.135" (10 GAGE)

SINGLE SQUARE TUBE SIGN TO POST INSTALLATION ON SLIP BASE

AS NOTED BY THE CIRCLE SYMBOL ● ON THE LOCATION AND SPECIFICATION SHEETS.

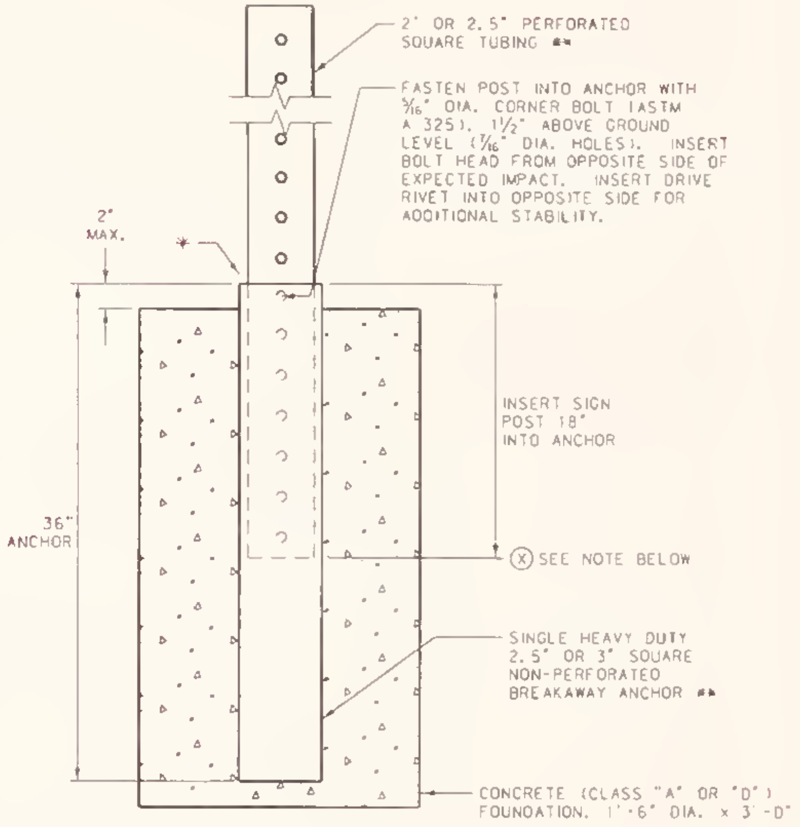

2.5" PERFORATED SQUARE TUBING **
3/8" DIA. (ASTM A 307) BOLT AND NUT (2 REQUIRED)
3.75" MAX.
SLIP BASE ASSEMBLY
1.25"
ⓧ SEE NOTE BELOW
*
1/2" × 3 3/4" BOLT AND NUT (2 REQUIRED)
0.75"
INSERT SLIP BASE 6" INTO ANCHOR
36" ANCHOR
SINGLE HEAVY DUTY 3" SQUARE NON-PERFORATED BREAKAWAY ANCHOR (0.188" WALL THICKNESS, 22.98 LB. EACH)
CONCRETE (CLASS "A" OR "D") FOUNDATION, 1'-6" DIA. × 3'-0"

* MINIMUM OF 2 SHIMS REQUIRED PER INSTALLATION TO TAKE UP TOLERANCE BETWEEN SLIP BASE STUB AND FOUNDATION ANCHOR.

** SUPPORT		
TUBE SIZE	WEIGHT	WALL THICKNESS
2.50"	3.80 LB./FT.	0.135 (10 GAGE)

SINGLE SQUARE TUBE SIGN POST INSTALLATION

AS NOTED BY THE TRIANGLE SYMBOL ▲ ON THE LOCATION AND SPECIFICATION SHEETS.


2" OR 2.5" PERFORATED SQUARE TUBING **
FASTEN POST INTO ANCHOR WITH 5/16" DIA. CORNER BOLT (ASTM A 325), 1 1/2" ABOVE GROUND LEVEL (7/16" DIA. HOLES). INSERT BOLT HEAD FROM OPPOSITE SIDE OF EXPECTED IMPACT. INSERT DRIVE RIVET INTO OPPOSITE SIDE FOR ADDITIONAL STABILITY.
2" MAX.
*
INSERT SIGN POST 18" INTO ANCHOR
36" ANCHOR
ⓧ SEE NOTE BELOW
SINGLE HEAVY DUTY 2.5" OR 3" SQUARE NON-PERFORATED BREAKAWAY ANCHOR **
CONCRETE (CLASS "A" OR "D") FOUNDATION, 1'-6" DIA. × 3'-0"

* MINIMUM OF 2 SHIMS REQUIRED PER INSTALLATION TO TAKE UP TOLERANCE BETWEEN SUPPORT AND ANCHOR.

** SUPPORT AND CORRESPONDING ANCHOR					
SUPPORT			ANCHOR		
TUBE SIZE	WEIGHT	WALL THICKNESS	TUBE SIZE	WEIGHT	WALL THICKNESS
2"	2.42 LB./FT.	0.105" (12 GAGE)	2 1/2"	18.36 LB. EA.	0.135"
2 1/2"	3.80 LB./FT.	0.135" (10 GAGE)	3"	22.98 LB. EA.	0.188"

NOTES:

ALTERNATE CRASH TESTED AND APPROVED BREAKAWAY DEVICES MAY BE USED AS AN OPTION WITH PRIOR APPROVAL OF THE MDT. CONTACT TRAFFIC ENGINEERING FOR INFORMATION.

USE CONCRETE CLASS "A" OR "D" WITH WOOD FLOAT FINISH ON TOP. FORM TOP SIX INCHES OF FOUNDATION.

GALVANIZE PIPE PER AASHTO M 111.

PAINT PIPE WITH ONE SHOP COAT AND ONE FIELD COAT OF ZINC RICH BASED PAINT AND ONE FIELD COAT OF ALUMINUM PAINT, AS SPECIFIED IN THE STANDARD SPECIFICATIONS SECTION 710, ON ALL SURFACES NOT IN CONTACT WITH THE CONCRETE.

CONFORM STEEL PIPE TO THE REQUIREMENTS OF ASTM A 53 TYPE E OR S, GRADE B.

SUBMIT SHOP DRAWINGS TO BE APPROVED BY THE MONTANA DEPARTMENT OF TRANSPORTATION BEFORE FABRICATION IS BEGUN.

ⓧ BASE POINT OF POST LENGTH MEASUREMENT. TYPE OF POSTS AND FOUNDATIONS, AS WELL AS LENGTHS ARE NOTED IN THE SIGNING QUANTITIES.

DETAILED DRAWING

REFERENCE
STANDARD SPEC.
SECTION 556, 619, 704

DWG. NO.
619-14

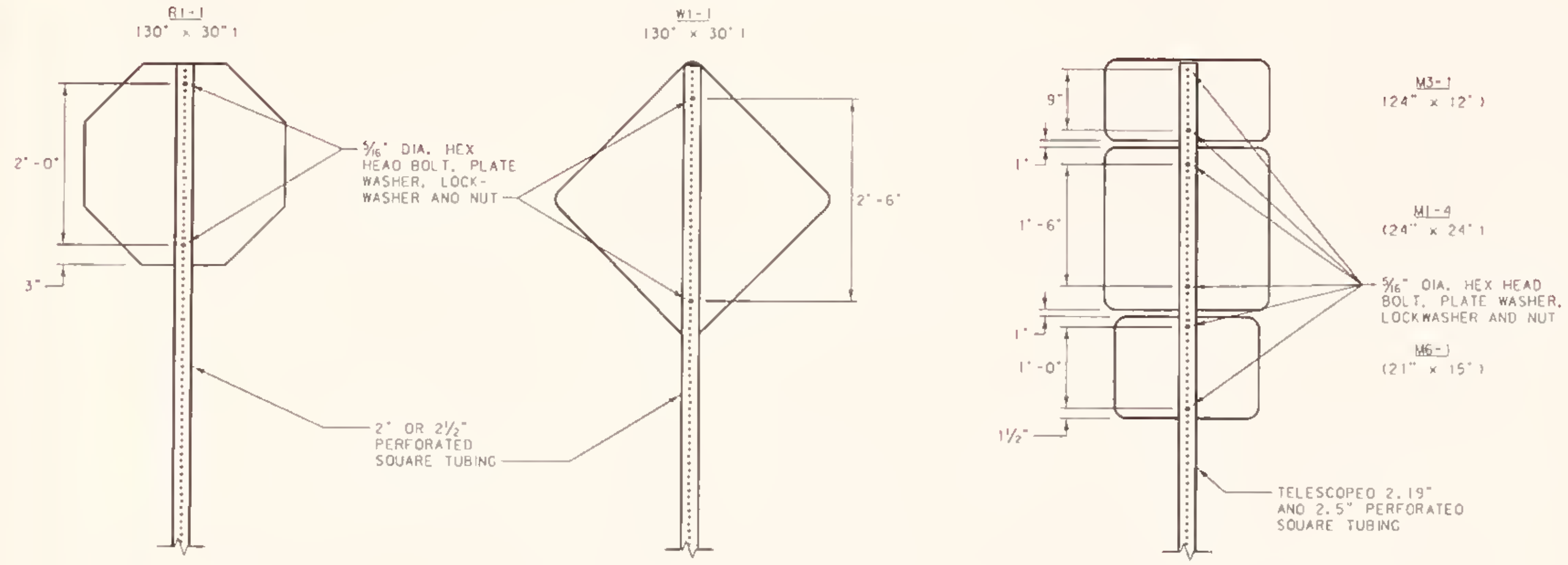
SIGN POST
BREAKAWAY DEVICES

EFFECTIVE: AUGUST 1999

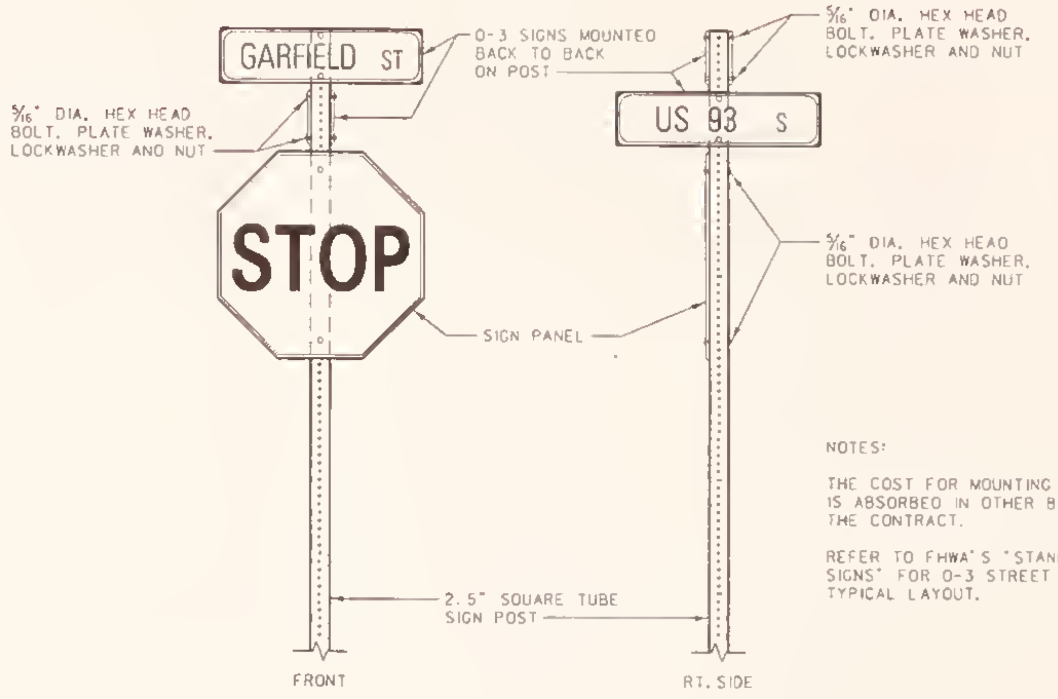
MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

SIGNS WITHOUT BACKBRACING

(SEE PLANS FOR BACKBRACING REQUIREMENTS)


R1-1
(30" × 30")
2'-0"
3"
5/16" DIA. HEX HEAD BOLT, PLATE WASHER, LOCK-WASHER AND NUT
W1-1
(30" × 30")
2'-6"
2" OR 2½" PERFORATED SQUARE TUBING
9"
1"
1'-6"
1"
1'-0"
1½"
M3-1
(24" × 12")
M1-4
(24" × 24")
5/16" DIA. HEX HEAD BOLT, PLATE WASHER, LOCKWASHER AND NUT
M6-1
(21" × 15")
TELESCOPED 2.19" AND 2.5" PERFORATED SQUARE TUBING

STREET NAME SIGN INSTALLATION


GARFIELD ST
D-3 SIGNS MOUNTED BACK TO BACK ON POST
5/16" DIA. HEX HEAD BOLT, PLATE WASHER, LOCKWASHER AND NUT
US 93 S
5/16" DIA. HEX HEAD BOLT, PLATE WASHER, LOCKWASHER AND NUT
STOP
SIGN PANEL
5/16" DIA. HEX HEAD BOLT, PLATE WASHER, LOCKWASHER AND NUT
2.5" SQUARE TUBE SIGN POST
FRONT
RT. SIDE

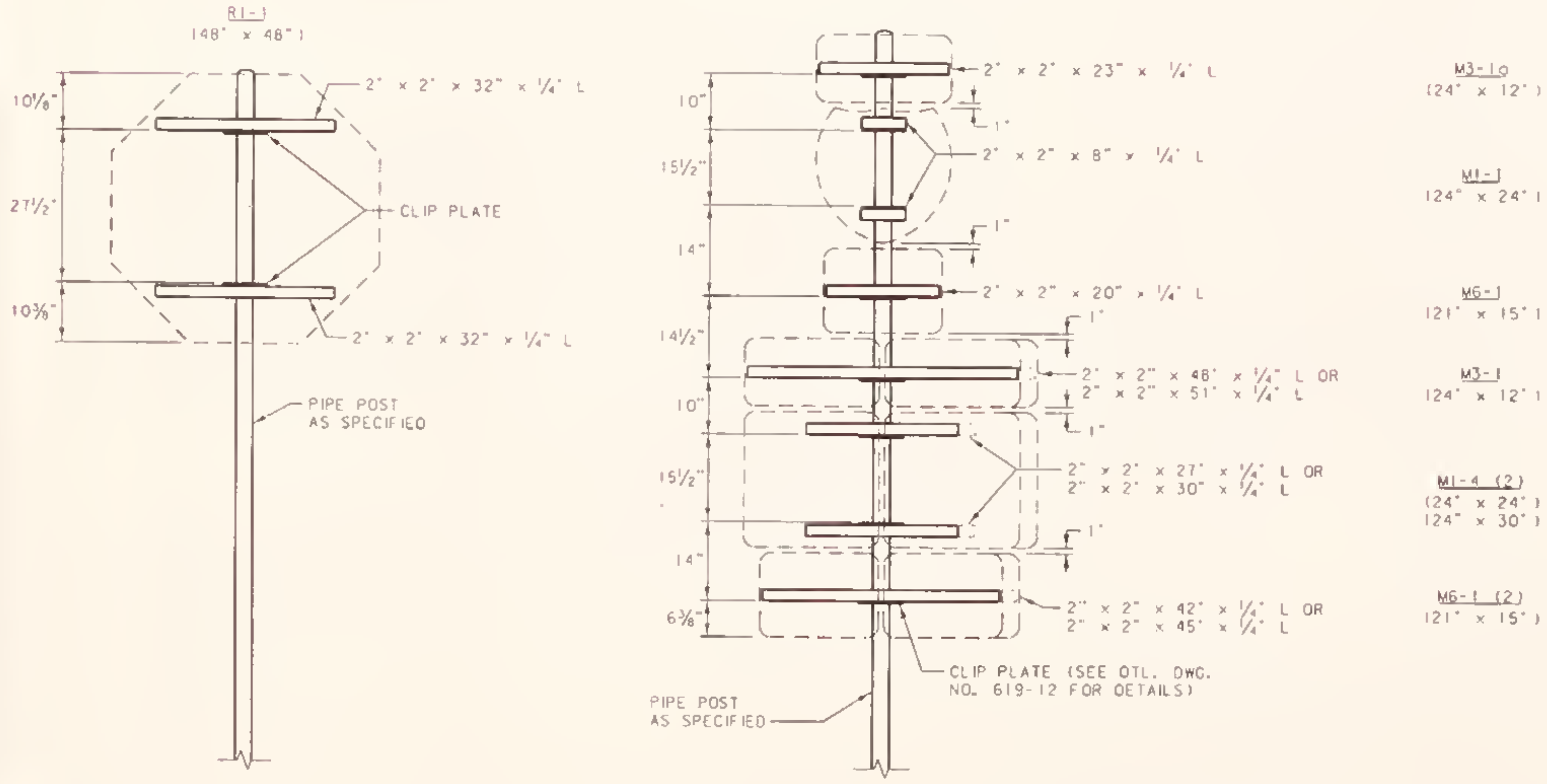
NOTES:

THE COST FOR MOUNTING D-3 SIGNS IS ABSORBED IN OTHER BID ITEMS OF THE CONTRACT.

REFER TO FHWA'S "STANDARD HIGHWAY SIGNS" FOR D-3 STREET NAME SIGN TYPICAL LAYOUT.

SIGNS WITH BACKBRACING

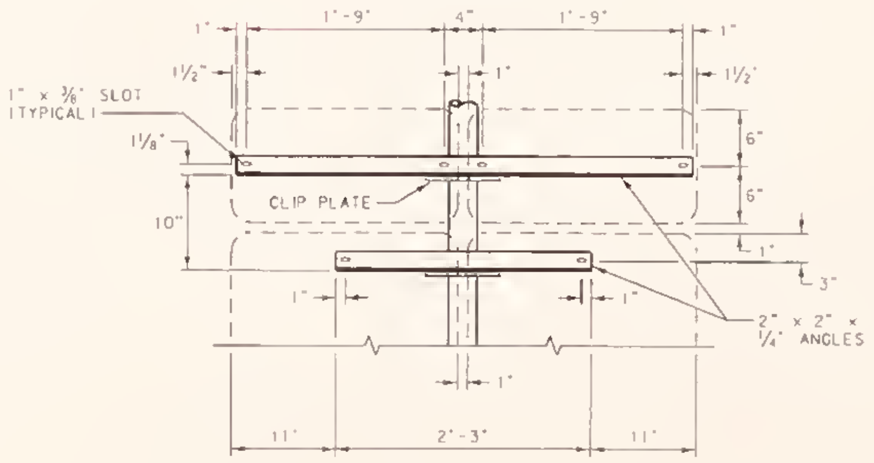
(SEE PLANS FOR BACKBRACING REQUIREMENTS)



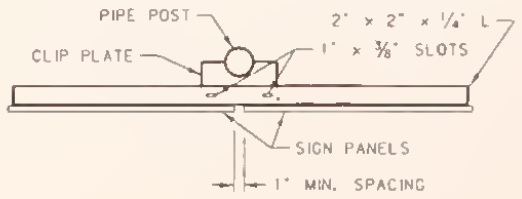
TYPICAL MOUNTING DETAILS

(FOR 3" DIA. AND LARGER PIPE)

ELEVATION



PLAN VIEW



NOTES:

VERTICAL DIMENSIONS SHOWN ARE FROM TOP TO TOP OF ALL POST CLIP PLATES.

PLACE A SUITABLE WATERTIGHT CAP ON TOP OF ALL PIPE POSTS.

BREAKAWAY DEVICES FOR SQUARE TUBING ARE SHOWN ON DTL. DWG. NO. 619-14.

CONFORM MATERIAL USED IN FABRICATION OF POST CLIPS AND ANGLE BRACKETS TO SECTION 556 OF THE STANDARD SPECIFICATIONS.

THE LENGTH OF EACH ANGLE BRACKET DEPENDS ON THE MOUNTING ASSEMBLY AND HOLE SPACING OF EACH SIGN. THE ASSEMBLIES SHOWN ARE TYPICAL INSTALLATIONS. ERECT SIMILAR ASSEMBLIES IN A LIKE MANNER.

REFER TO FHWA'S "STANDARD HIGHWAY SIGNS" FOR STANDARD HOLE SPACING IN SIGNS.

DETAILED DRAWING

REFERENCE
STANDARD SPEC.
SECTION 556, 619, 704

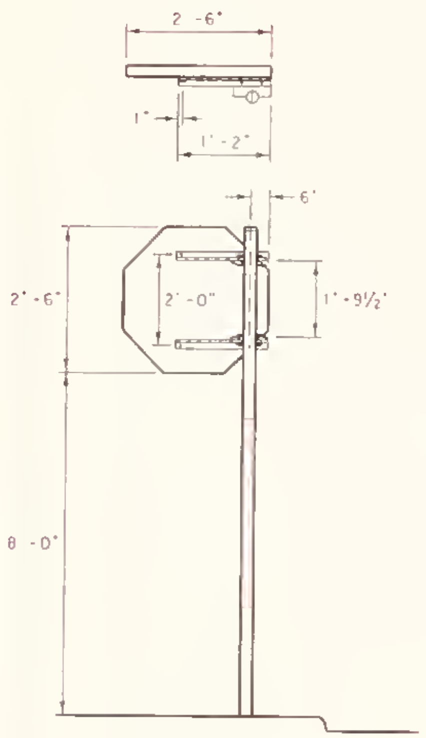
DWG. NO.
619-16

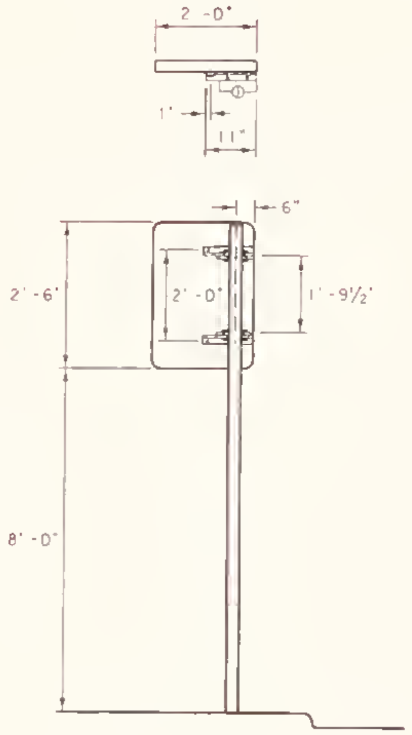
TYPICAL STEEL POST
MOUNTING DETAILS

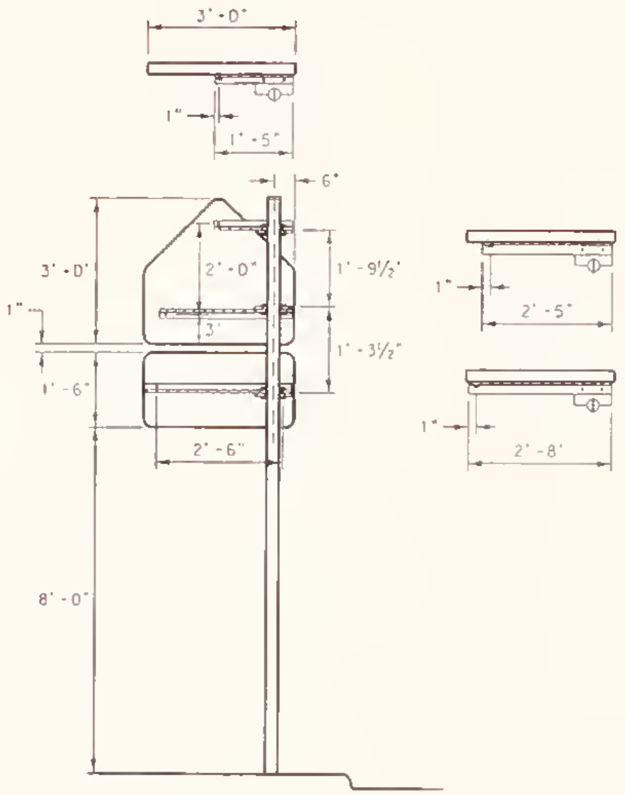
EFFECTIVE: AUGUST 1999

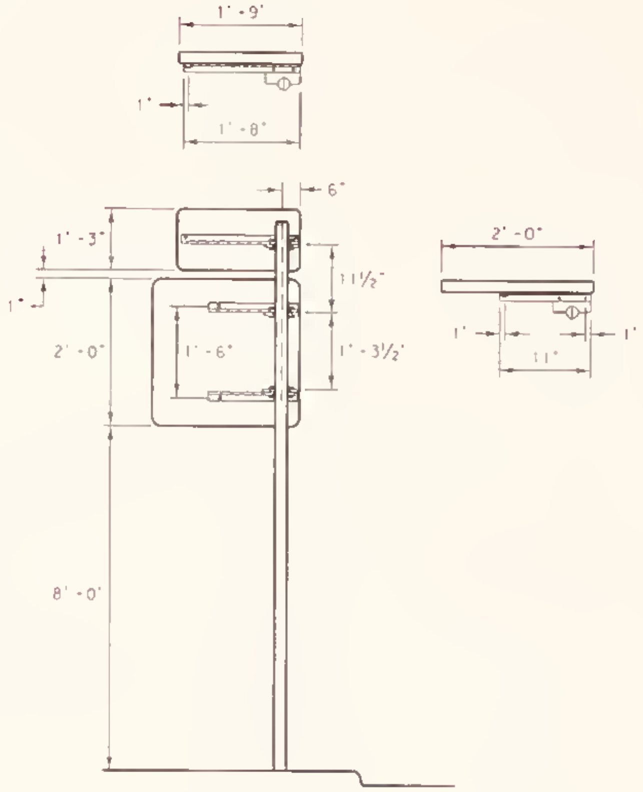
MONTANA DEPARTMENT
OF TRANSPORTATION

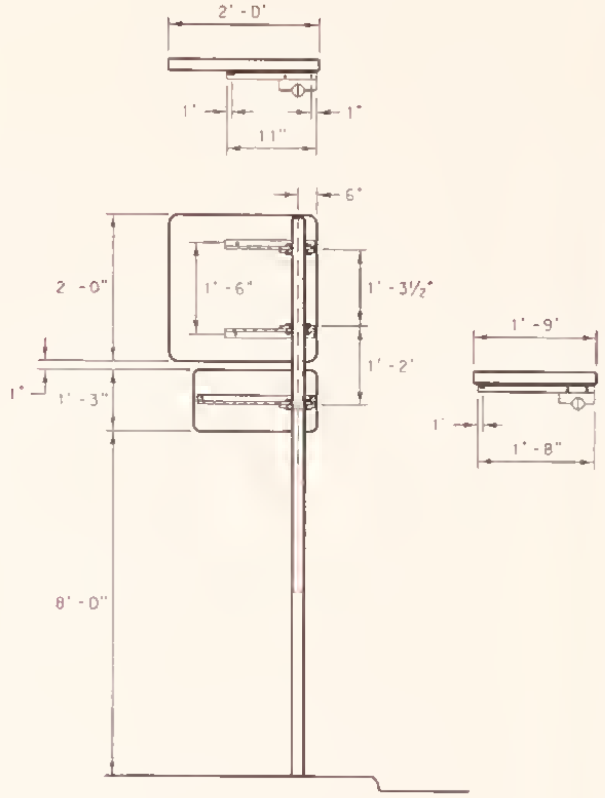
MONTANA
CADD

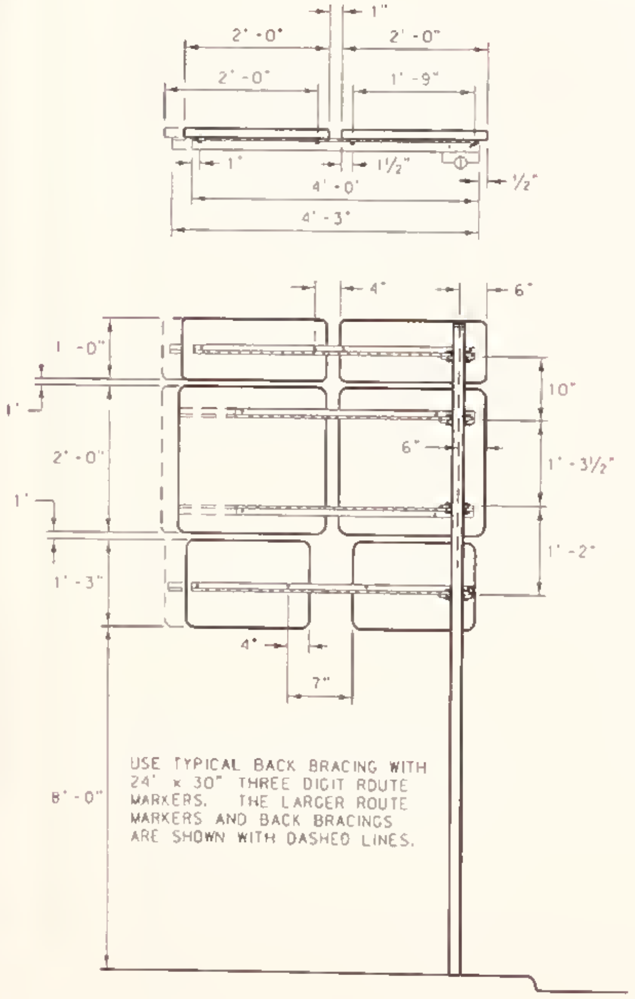






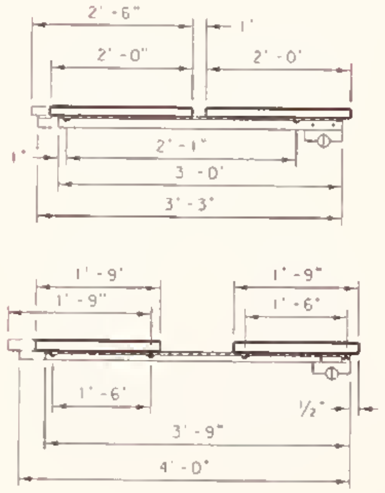


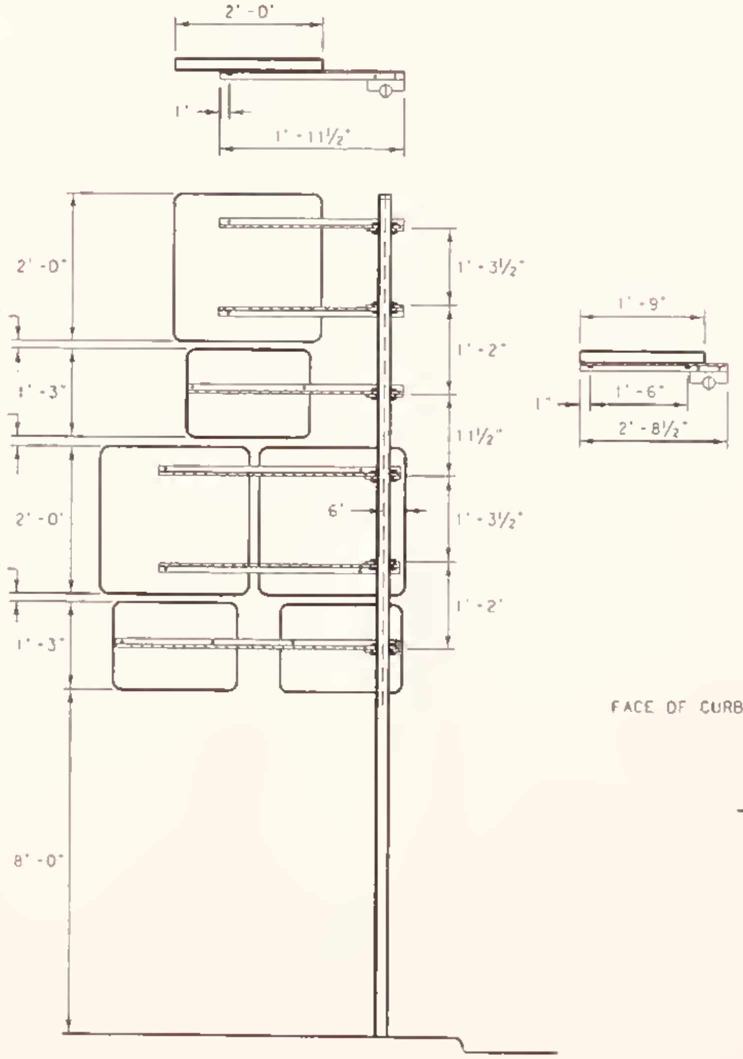




USE TYPICAL BACK BRACING WITH 24" x 30" THREE DIGIT ROUTE MARKERS. THE LARGER ROUTE MARKERS AND BACK BRACINGS ARE SHOWN WITH DASHED LINES.

NOTE:
ALTERNATE MOUNTING MUST BE APPROVED BY THE ENGINEER.





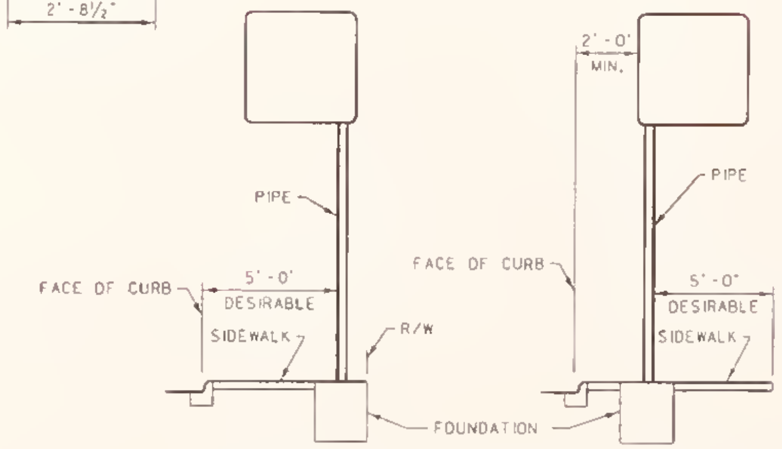
NOTES:

REFER TO FHWA'S MANUAL "STANDARD HIGHWAY SIGNS" FOR STANDARD HOLE SPACING IN SIGNS.

USE POST CLIPS AS SHOWN IN SIGNING DETAILED DRAWING NO. 619-12 WHEN CANTILEVER MOUNTING IS NECESSARY.

USE POSTS ONE SIZE LARGER THAN THOSE REQUIRED FOR STANDARD MOUNTINGS.

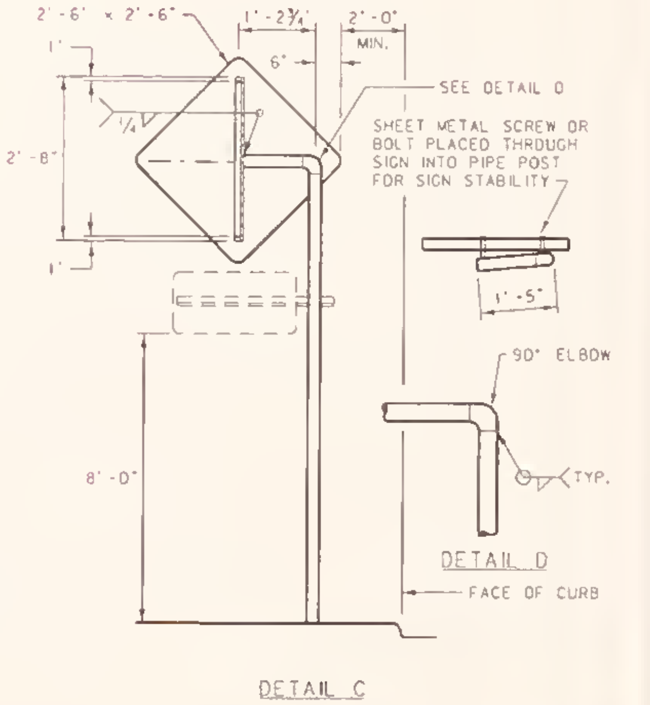
DIMENSIONS FOR POST CLIP SPACING ARE SHOWN TO THE TOP OF EACH CLIP.



ALTERNATE A

ALTERNATE B

USE THE STANDARD TYPE MOUNTING BEHIND SIDEWALKS IF R/W LIMITS PERMIT. IF R/W DOES NOT PERMIT, THEN ALTERNATE A SHOULD BE USED BEHIND SIDEWALKS OR IN THE SIDEWALK NEXT TO A BUILDING. IF CONDITIONS ARE SUCH THAT THE SIGN CANNOT BE MOUNTED ON THE BACKSIDE OF THE SIDEWALK THEN USE ALTERNATE B.



DETAIL D

DETAIL C

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 556, 619, 704
DWG. NO.
619-18

CANTILEVER TYPE SIGN
SUPPORT DETAILS
FOR SIDEWALK AREAS

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

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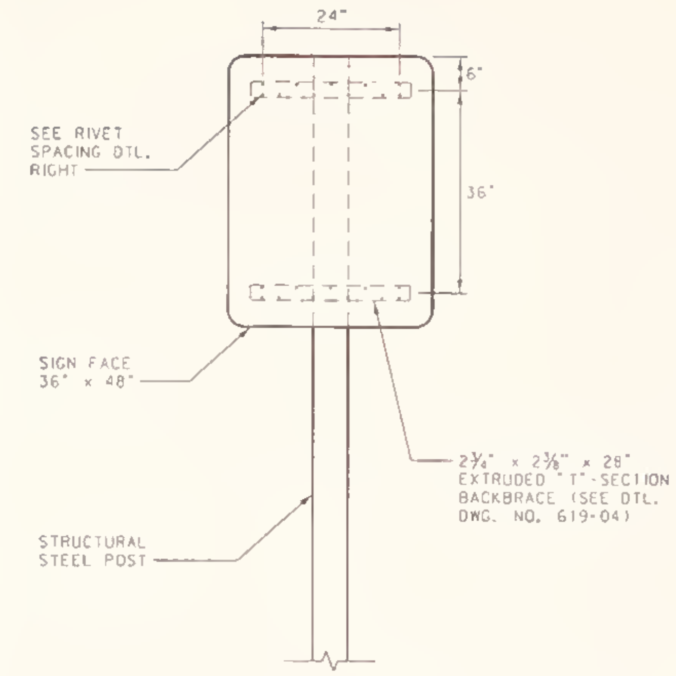
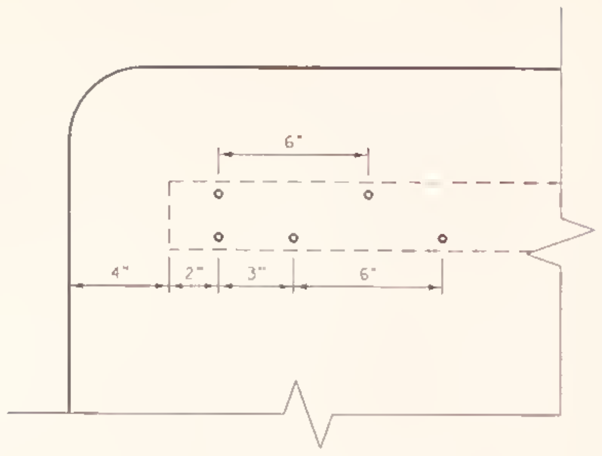
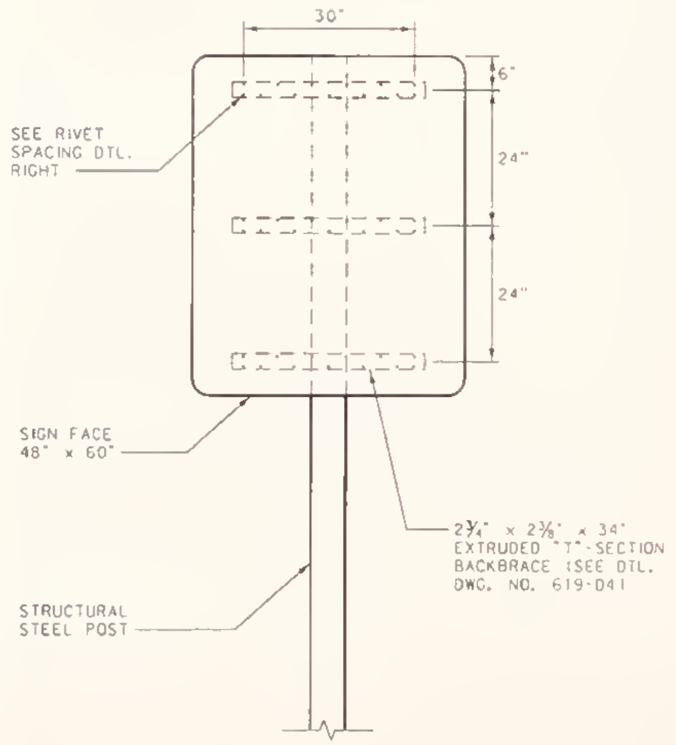
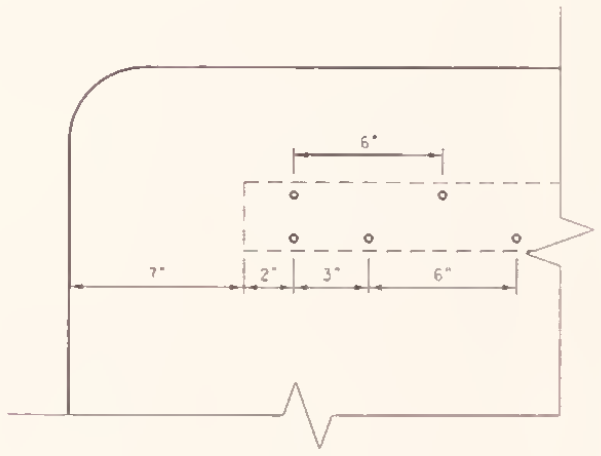

24"
6"
36"
SEE RIVET SPACING DTL. RIGHT
SIGN FACE 36" x 48"
2¾" x 2⅜" x 28" EXTRUDED "T"-SECTION BACKBRACE (SEE DTL. DWG. NO. 619-04)
STRUCTURAL STEEL POST



RIVET SPACING


30"
6"
24"
24"
SEE RIVET SPACING DTL. RIGHT
SIGN FACE 48" x 60"
2¾" x 2⅜" x 34" EXTRUDED "T"-SECTION BACKBRACE (SEE DTL. DWG. NO. 619-04)
STRUCTURAL STEEL POST



RIVET SPACING

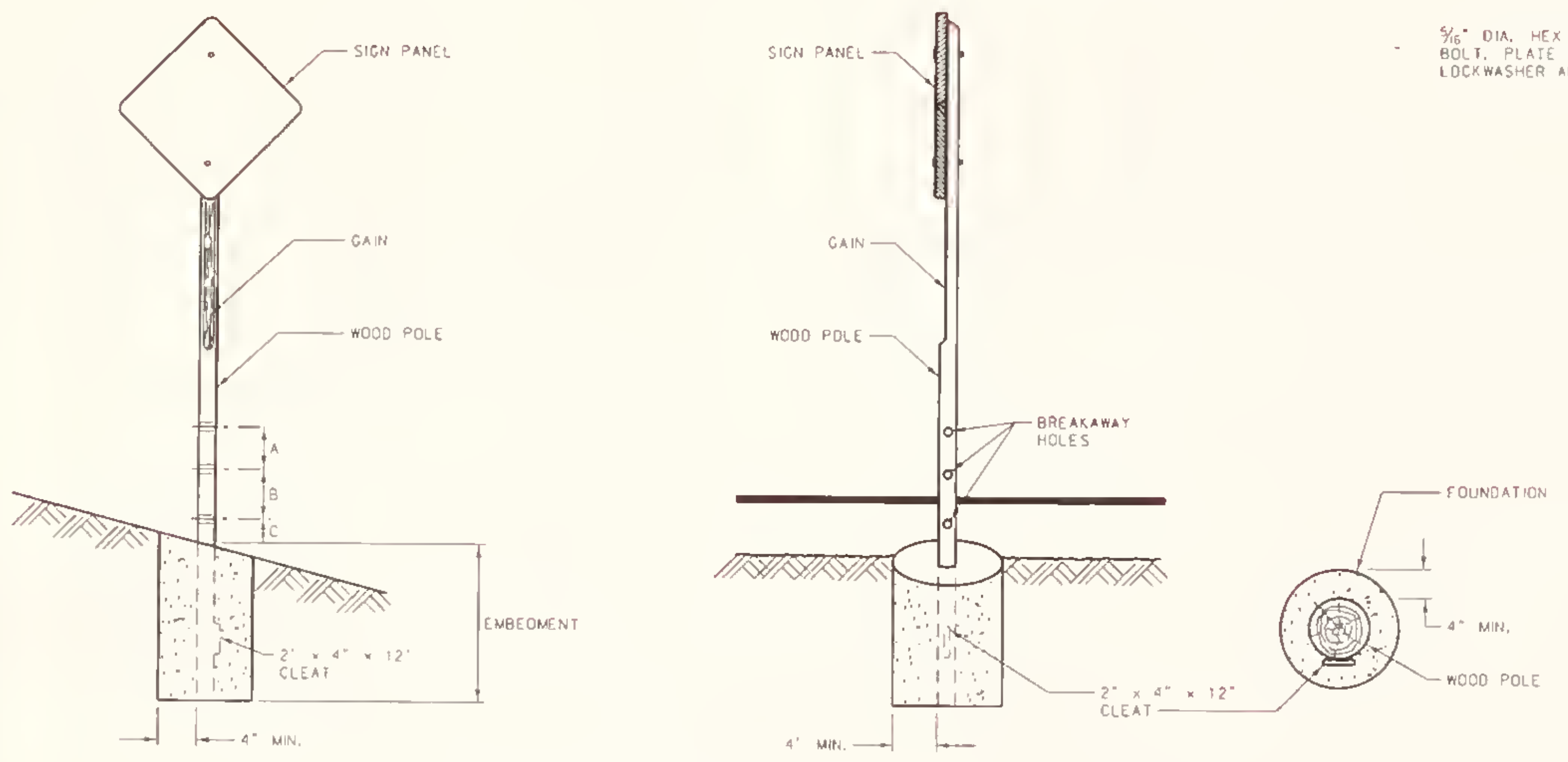
NOTE:
SEE THE PLANS
FOR BACKBRACING
REQUIREMENTS.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 619.704
DWG. NO.
619-19

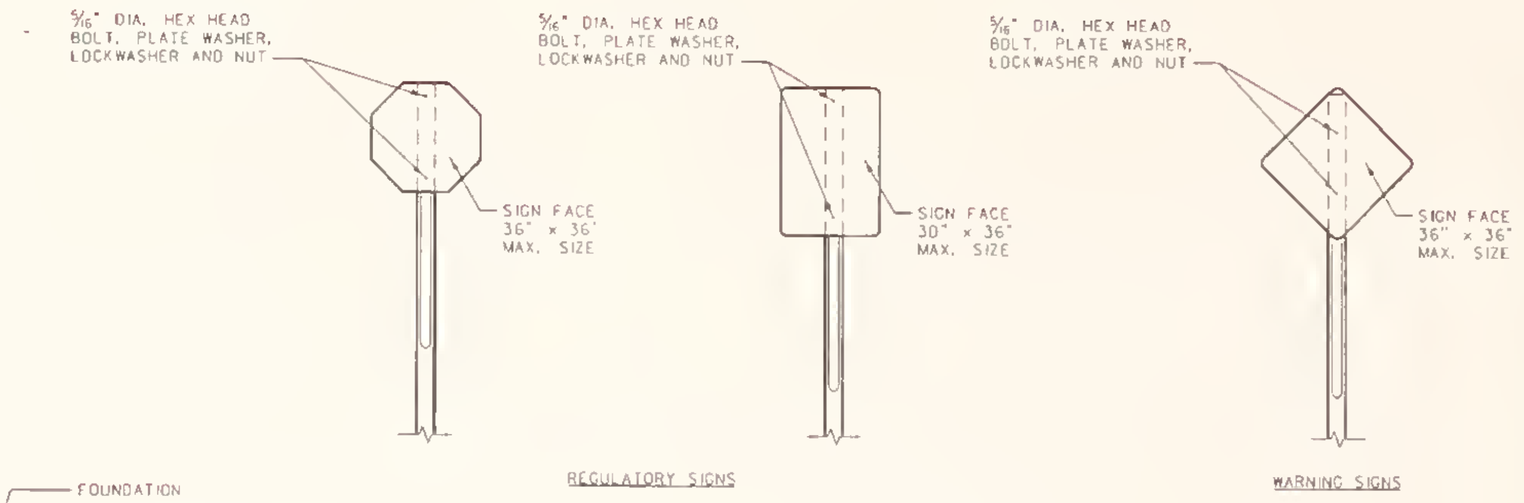
STRUCTURAL
STEEL POST
SIGN MOUNTING DETAILS

EFFECTIVE: AUGUST 1999

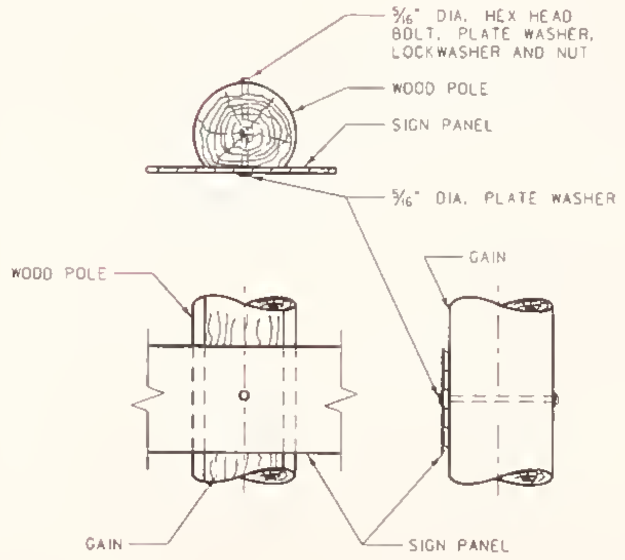
MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



BREAKAWAY AND FOOTING DETAILS


5/16" DIA. HEX HEAD BOLT, PLATE WASHER, LOCKWASHER AND NUT
SIGN FACE 36" x 36" MAX. SIZE
5/16" DIA. HEX HEAD BOLT, PLATE WASHER, LOCKWASHER AND NUT
SIGN FACE 30" x 36" MAX. SIZE
5/16" DIA. HEX HEAD BOLT, PLATE WASHER, LOCKWASHER AND NUT
SIGN FACE 36" x 36" MAX. SIZE
REGULATORY SIGNS
WARNING SIGNS

TYPICAL SIGN MOUNTINGS
(NO BACKBRACING)



SIGN MOUNTING DETAIL

NOTES:

CONFORM ALL WOOD POLES TO THE REQUIREMENTS OF SECTION 704 OF THE STANDARD SPECIFICATIONS.

GAIN ALL POLES ON THE SIGN SIDE THE MINIMUM WIDTH SHOWN IN THE TABLE, FOR HALF THE LENGTH OF EACH POLE.

BREAKAWAY DETAILS ARE STANDARD FOR ALL WOOD POLES LISTED IN THE TABLE, ON SINGLE AND MULTIPLE SIGN SUPPORTS.

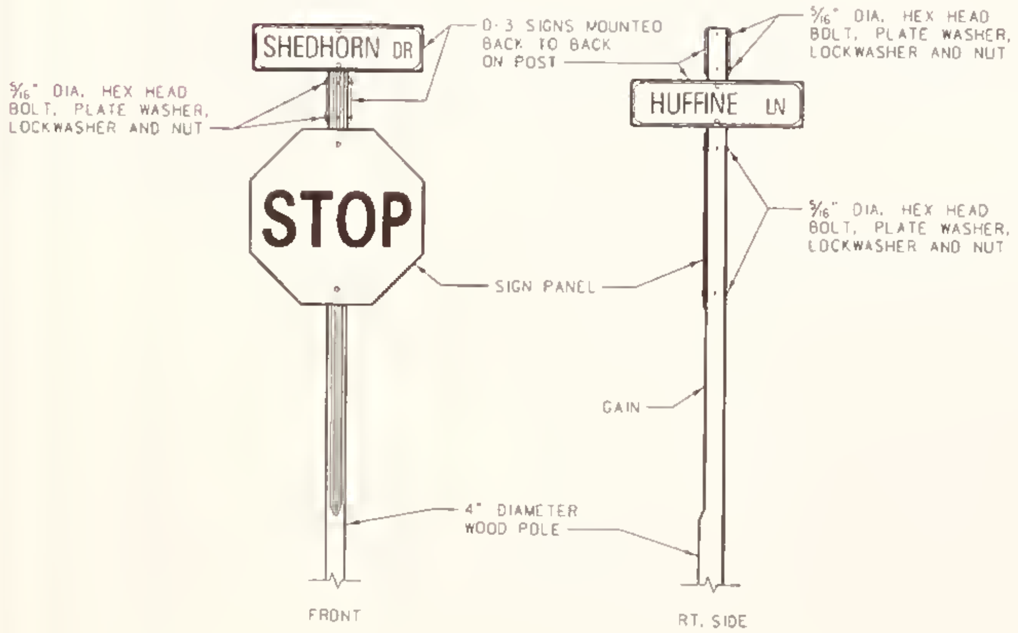
ALL BOLTS, NUTS AND WASHERS MUST CONSIST OF ALUMINUM, STAINLESS STEEL OR CADMIUM PLATED STEEL MATERIAL.

ATTACH A 2" x 4" x 12" BOARD 12' FROM THE BOTTOM OF THE POLE TO PREVENT SPINNING. ATTACH THIS CLEAT BY DRIVING TWO 16d NAILS THROUGH THE CLEAT AND INTO THE POLE. TREAT THE 2" x 4" CLEAT ACCORDING TO THE STANDARD SPECIFICATIONS.

⊗ THE MAXIMUM CROSS-SECTIONAL AREA AT A POINT 4" ABOVE GROUND LEVEL MAY NOT EXCEED 24 SQUARE INCHES EXCLUSIVE OF DRILLED BREAKAWAY HOLES FOR UNPROTECTED POST INSTALLATIONS. THE HOLE DIAMETER MAY BE ENLARGED IF NECESSARY TO INSURE THIS REQUIREMENT IS MET.

USE SOIL CEMENT FOR THE FOUNDATION - SEE SECTION 619.03.3 OF THE STANDARD SPECIFICATIONS.

FOR SIGNS REQUIRING BACKBRACING, CONSULT DTL. DWG. NO. 619-21 AND 619-22 FOR BACKBRACING OPTIONS AND DETAILS.

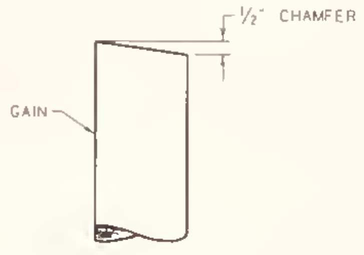

SHEDHORN DR
D-3 SIGNS MOUNTED BACK TO BACK ON POST
5/16" DIA. HEX HEAD BOLT, PLATE WASHER, LOCKWASHER AND NUT
STOP
SIGN PANEL
4" DIAMETER WOOD POLE
FRONT
HUFFINE LN
5/16" DIA. HEX HEAD BOLT, PLATE WASHER, LOCKWASHER AND NUT
5/16" DIA. HEX HEAD BOLT, PLATE WASHER, LOCKWASHER AND NUT
GAIN
RT. SIDE

NOTES:

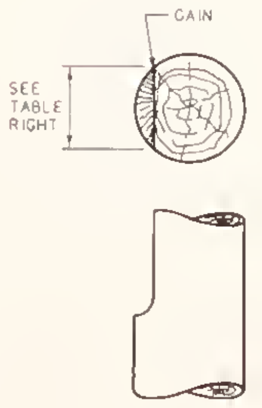
THE COST FOR MOUNTING D-3 SIGNS IS ABSORBED IN OTHER BID ITEMS OF THE CONTRACT.

REFER TO FHWA'S "STANDARD HIGHWAY SIGNS" FOR D-3 STREET NAME SIGN TYPICAL LAYOUT.

STREET NAME SIGN INSTALLATION



TOP END TREATMENT



GAIN DETAIL

POLE SIZE	A	B	C	HOLE DIA. (SEE NOTE ⊗)	EMBEDMENT	GAIN
3" TOP DIA.	~	~	~	~	3'-0"	$2\frac{3}{4}$"
4" TOP DIA.	~	~	~	~	3'-0"	$3\frac{1}{2}$"
5" TOP DIA.	~	12"	4"	2"	3'-6"	4"
6" TOP DIA.	~	12"	4"	$2\frac{1}{2}$"	4'-6"	4"
CLASS 4	~	12"	4"	2"	5'-0"	4"
CLASS 3	~	12"	4"	$2\frac{1}{2}$"	5'-6"	4"
CLASS 2	6"	6"	4"	2"	6'-0"	4"
CLASS 1	6"	6"	4"	$2\frac{1}{2}$"	6'-6"	4"

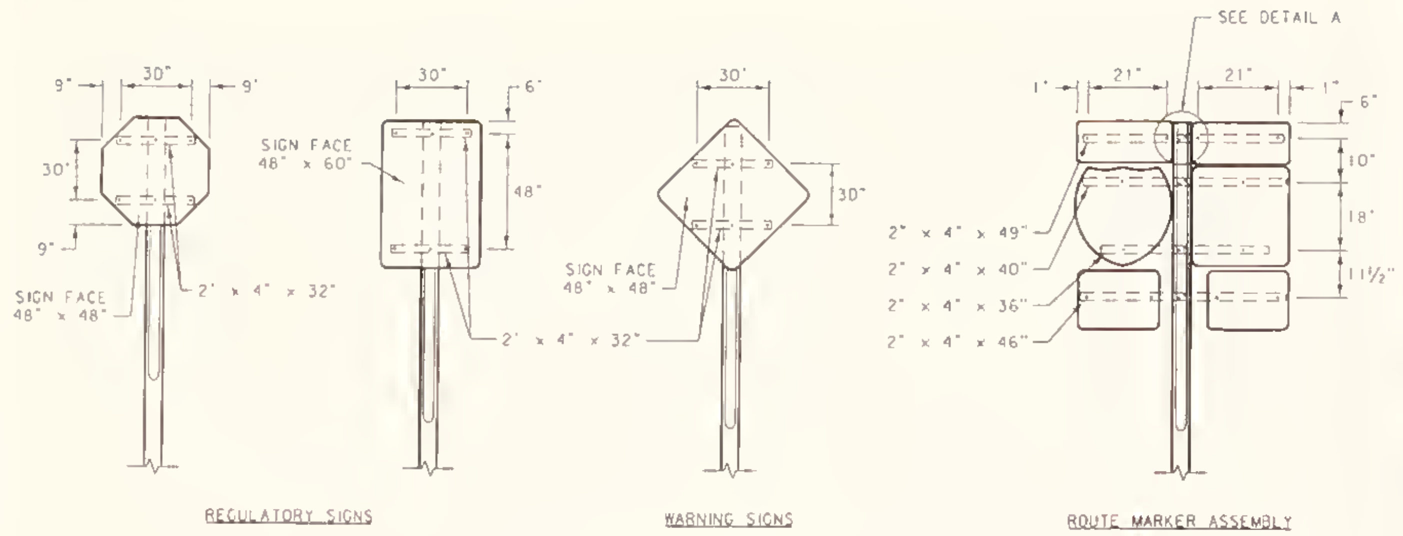
MUST BE PROTECTED OR OUT OF CLEAR ZONE (6" TOP DIA. THROUGH CLASS 1)

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 619, 704
DWG. NO.
619-20

TREATED WOOD POLE
SIGN MOUNTING AND
SUPPORT DETAILS

EFFECTIVE: AUGUST 1999

MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



REGULATORY SIGNS

WARNING SIGNS

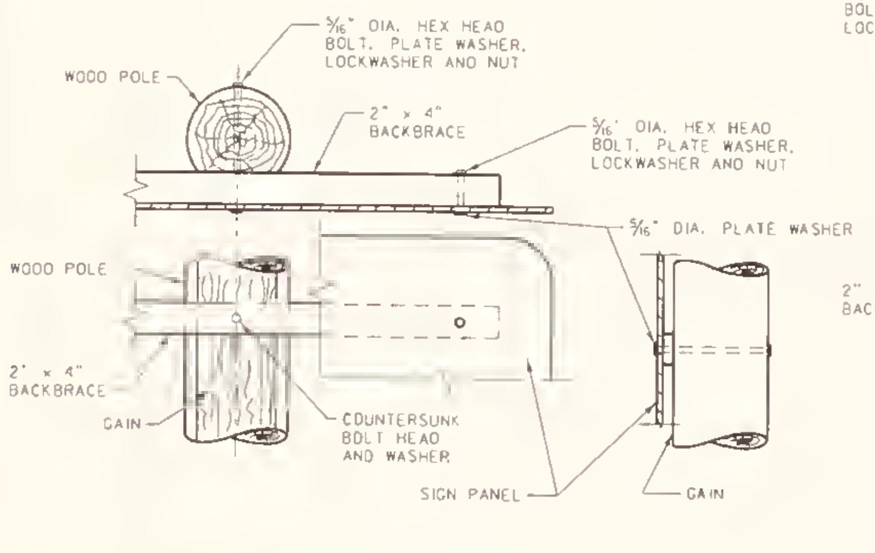
ROUTE MARKER ASSEMBLY

WOOD BACKBRACE INSTALLATIONS

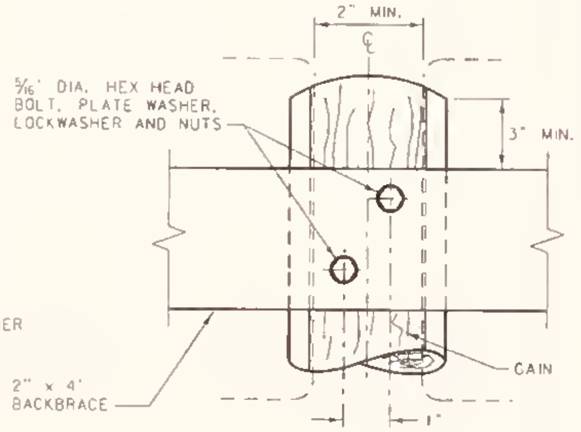
NOTE:

SIGNS OF THESE SIZES AND LARGER REQUIRE WOOD BACKBRACING.

SMALLER SIGNS MAY REQUIRE BACKBRACING IF THE CONDITIONS WARRANT (SEE SIGNING PLANS). IN THIS CASE, THE CONTRACTOR HAS THE OPTION OF USING WOOD OR STEEL BACKBRACING (SEE DTL. DWG. NO. 619-22).


5⁄16" DIA. HEX HEAD BOLT, PLATE WASHER, LOCKWASHER AND NUT
WOOD POLE
2" × 4" BACKBRACE
5⁄16" DIA. HEX HEAD BOLT, PLATE WASHER, LOCKWASHER AND NUT
5⁄16" DIA. PLATE WASHER
WOOD POLE
2" × 4" BACKBRACE
GAIN
COUNTERSUNK BOLT HEAD AND WASHER
SIGN PANEL
GAIN

SIGN MOUNTING DETAIL



DETAIL A

(BACKBRACE)

NOTES:

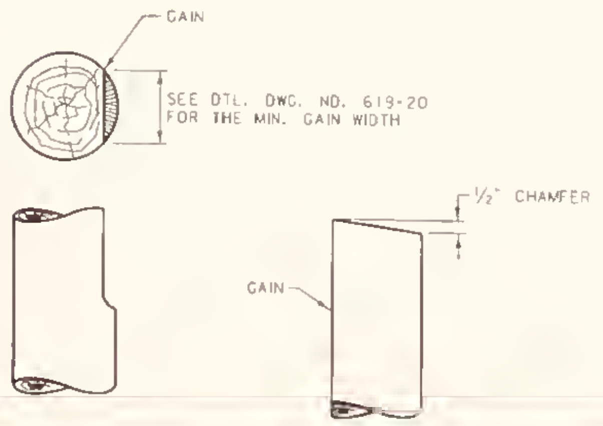
CONFORM ALL WOOD POLES TO THE REQUIREMENTS OF SECTION 704 OF THE STANDARD SPECIFICATIONS.

GAIN ALL POLES ON THE SIGN SIDE THE MINIMUM WIDTH SHOWN IN THE TABLE ON DTL. DWG. NO. 619-20, FOR HALF THE LENGTH OF EACH POLE.

USE 2" × 4" S4S LUMBER FOR ALL WOOD BACKBRACING, CONFORMING TO THE REQUIREMENTS OF SECTION 704 OF THE STANDARD SPECIFICATIONS.

ALL BOLTS, NUTS AND WASHERS MUST CONSIST OF ALUMINUM, STAINLESS STEEL OR CADMIUM PLATED STEEL MATERIAL.

SEE DTL. DWG. NO. 619-20 FOR BREAKAWAY AND SUPPORT DETAILS.



GAIN DETAIL

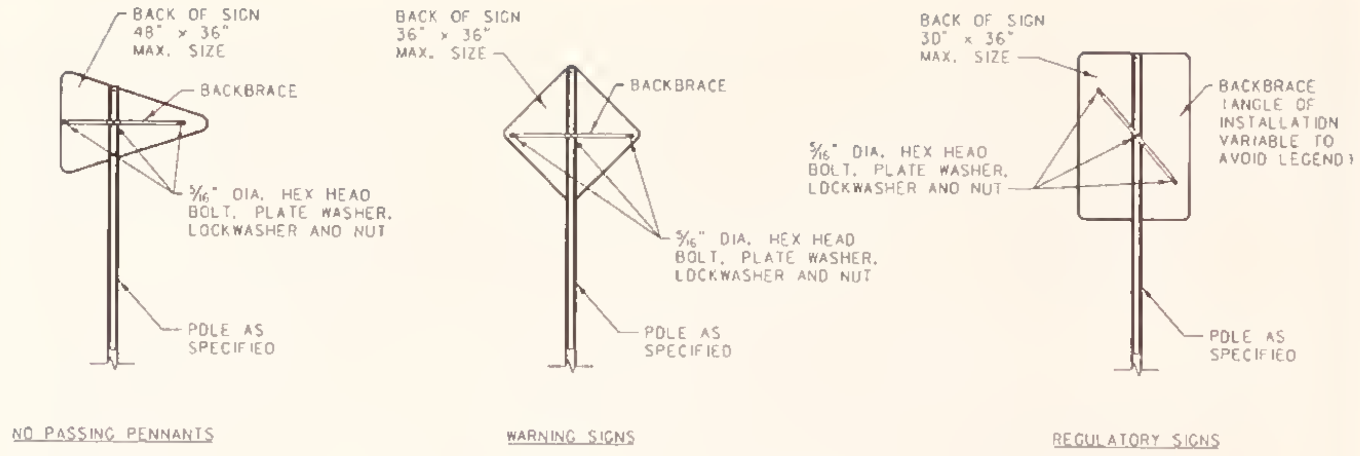
TOP END TREATMENT

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 619, 704
DWG. NO.
619-21

TREATED WOOD POLE
SIGN MOUNTING DETAILS

EFFECTIVE: AUGUST 1999

MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

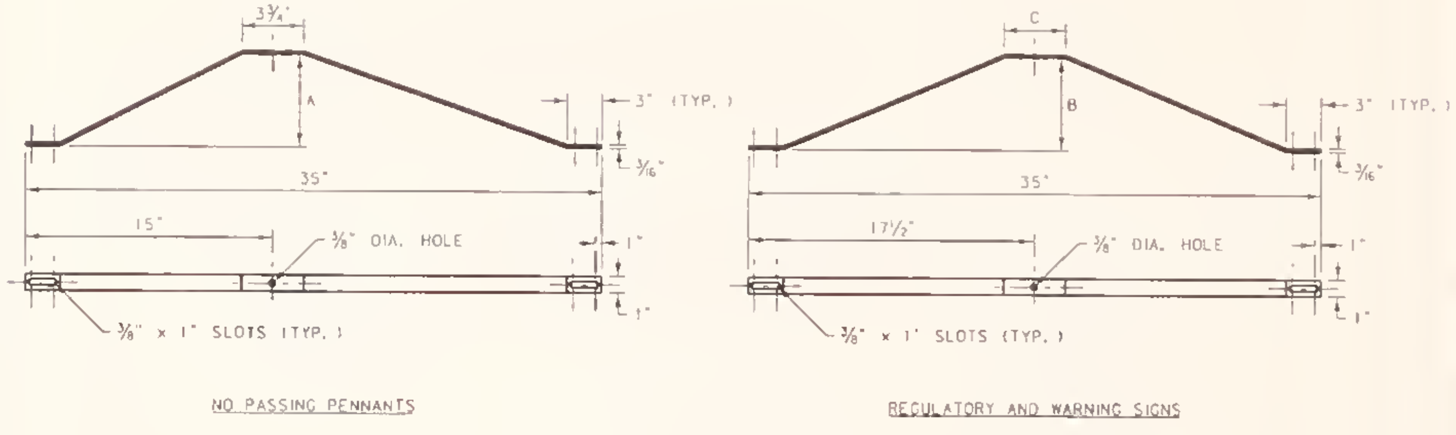

BACK OF SIGN
48" × 36"
MAX. SIZE
BACKBRACE
5⁄16" DIA. HEX HEAD BOLT, PLATE WASHER, LOCKWASHER AND NUT
POLE AS SPECIFIED
BACK OF SIGN
36" × 36"
MAX. SIZE
BACKBRACE
5⁄16" DIA. HEX HEAD BOLT, PLATE WASHER, LOCKWASHER AND NUT
POLE AS SPECIFIED
BACK OF SIGN
30" × 36"
MAX. SIZE
BACKBRACE (ANGLE OF INSTALLATION VARIABLE TO AVOID LEGEND)
5⁄16" DIA. HEX HEAD BOLT, PLATE WASHER, LOCKWASHER AND NUT
POLE AS SPECIFIED

NO PASSING PENNANTS

WARNING SIGNS

REGULATORY SIGNS

STEEL BACKBRACE INSTALLATIONS

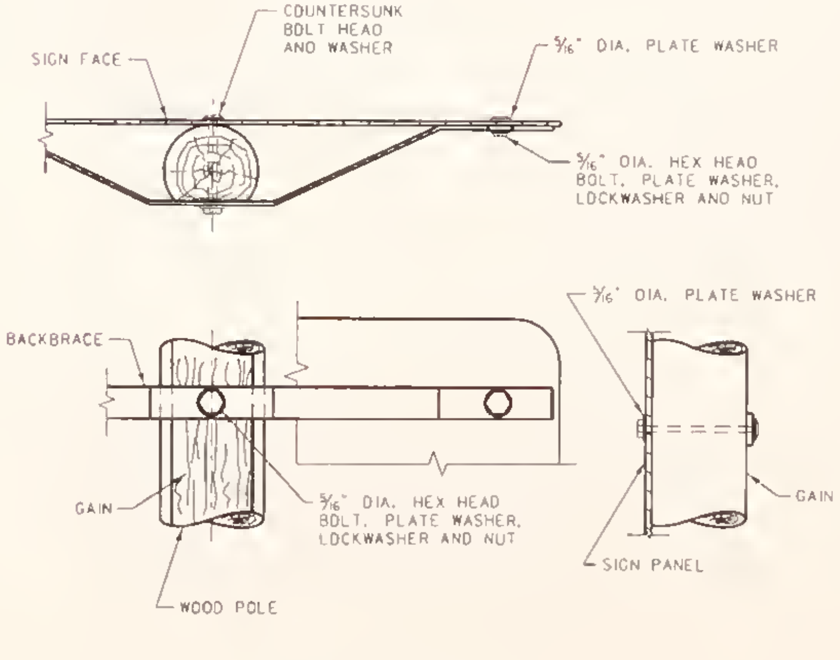


NO PASSING PENNANTS

REGULATORY AND WARNING SIGNS

STEEL BACKBRACE DETAILS

POLE DIA.	A	B	C
3"	2⅛"	2⅛"	3¾"
4"	3"	3"	3¾"
5"	~	4"	4¼"
6"	~	5¼"	4¼"


COUNTERSUNK BOLT HEAD AND WASHER
SIGN FACE
5⁄16" DIA. PLATE WASHER
5⁄16" DIA. HEX HEAD BOLT, PLATE WASHER, LOCKWASHER AND NUT
5⁄16" DIA. PLATE WASHER
BACKBRACE
GAIN
5⁄16" DIA. HEX HEAD BOLT, PLATE WASHER, LOCKWASHER AND NUT
GAIN
SIGN PANEL
WOOD POLE

SIGN MOUNTING DETAIL

NOTES:

USE COMMERCIAL QUALITY, MILD STEEL, HOT-DIPPED AFTER FABRICATION. GALVANIZE ACCORDING TO THE SPECIFICATIONS OF AASHTO M 111.

SEE DTL. DWG. NO. 619-21 FOR APPLICATIONS OF THIS TYPE OF BRACE AND ADDITIONAL SIGN MOUNTING REQUIREMENTS.

SEE DTL. DWG. NO. 619-20 FOR BREAKAWAY AND SUPPORT DETAILS.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 619
DWG. NO.
619-22

TREATED WOOD POLE
OPTIONAL BACKBRACE

EFFECTIVE: AUGUST 1999

MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

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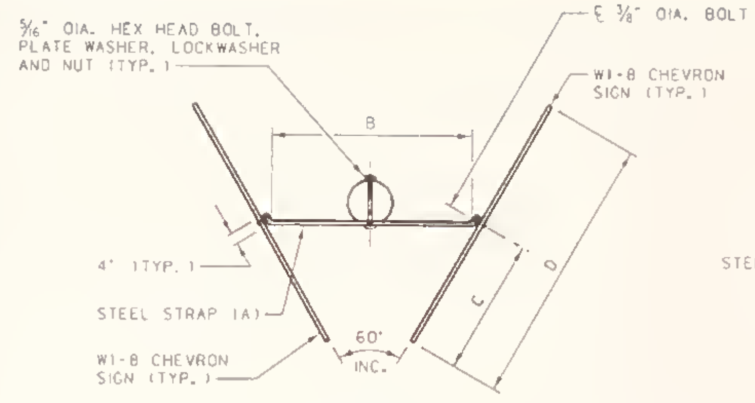
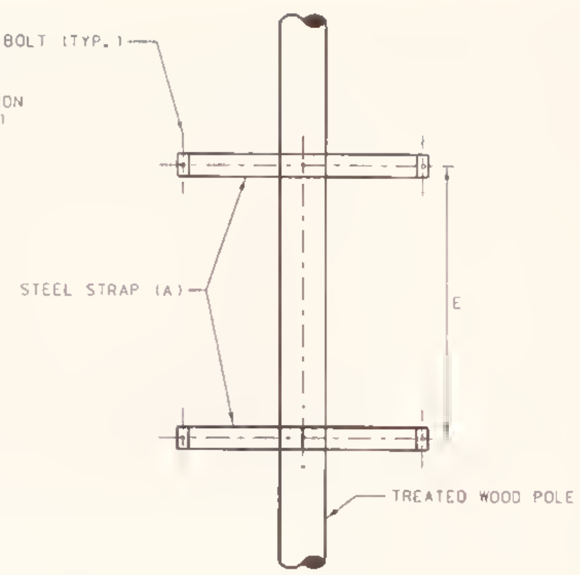


PLAN VIEW

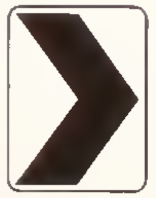


ELEVATION

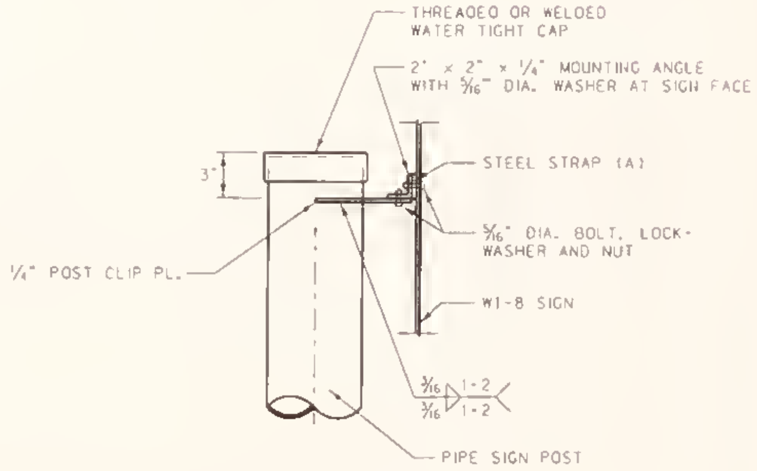
SIGN SIZE	DIMENSIONS				
	A	B	C	D	E
18" × 24"	1/4" × 2" × 1'-11"	15"	9"	18"	18"
24" × 30"	1/4" × 2" × 2'-2"	18"	12"	24"	24"
30" × 36"	1/4" × 2" × 2'-5"	21"	15"	30"	30"
36 × 48"	1/4" × 2" × 2'-8"	24"	18"	36"	36"

WOOD POST MOUNTING

MOUNT 2 CHEVRON SIGNS ON EACH POST WITH EACH PANEL ADJUSTED TO APPROXIMATE RIGHT ANGLE TO ROADWAY CENTERLINE. EXACT LOCATION AND ANGLE TO BE DETERMINED BY ENGINEER.



W1-8 CHEVRON ALIGNMENT SIGNS MAY BE USED AS AN ALTERNATE OR AS A SUPPLEMENT TO DELINEATION TO PROVIDE ADDITIONAL EMPHASIS AND GUIDANCE WHEN A CHANGE IN HORIZONTAL ALIGNMENT EXISTS IN THE ROADWAY.


THREADED OR WELDED WATER TIGHT CAP
2" × 2" × 1/4" MOUNTING ANGLE WITH 5/16" DIA. WASHER AT SIGN FACE
STEEL STRAP (A)
3"
5/16" DIA. BOLT, LOCK-WASHER AND NUT
1/4" POST CLIP PL.
W1-8 SIGN
3/16 1-2
3/16 1-2
PIPE SIGN POST

STEEL PIPE MOUNTING

NOTES:

INSTALL CHEVRONS WITH A MINIMUM 10'-0" HORIZONTAL CLEARANCE AND A 5'-0" VERTICAL MOUNTING HEIGHT.

SPACING FOR DESIGN PURPOSES IS DOUBLE THE SPACING SHOWN IN THE TABLE ON DTL. DWG. NO. 619-36, UP TO A MAXIMUM CHEVRON SPACING OF 200'. A MINIMUM OF 3 VISIBLE CHEVRONS ARE REQUIRED THROUGH A CURVE.

FIELD INSPECT THE CHEVRONS AT NIGHT AND ADJUST THEIR LOCATIONS TO ACHIEVE 500' OF VISIBILITY.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 619
DWG. NO.
619-24

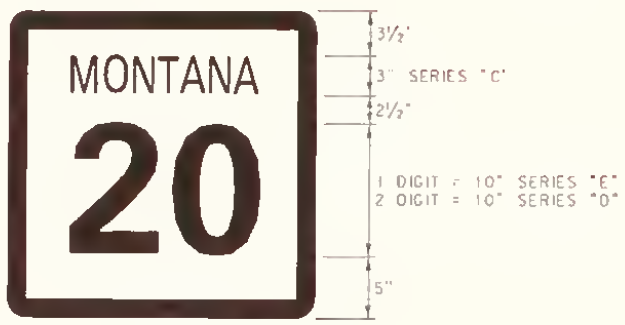
CHEVRON MOUNTING DETAILS

EFFECTIVE: AUGUST 1999

MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

PANELS

FOR USE ON ROUTE MARKER ASSEMBLIES



M1-5

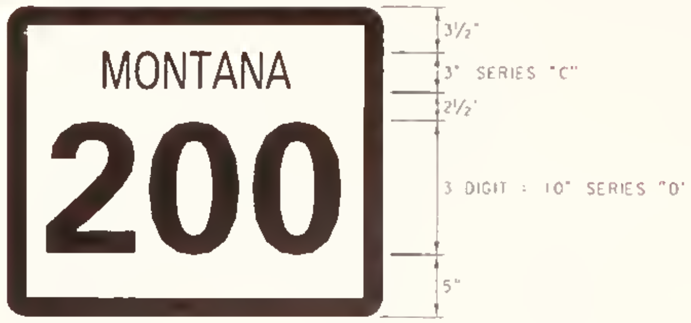
24" × 24"

MARGIN = NONE

BORDER = 1½"

CORNER RADIUS = 1½"

BLACK LEGEND AND BORDER ON A RETRO-REFLECTORIZED WHITE BACKGROUND.



M1-5

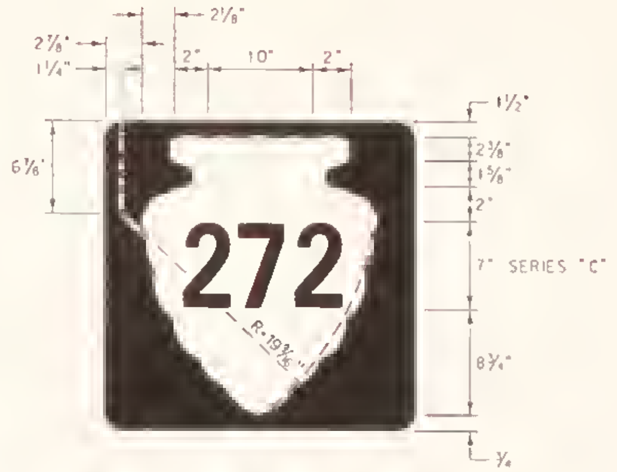
30" × 24"

MARGIN = NONE

BORDER = 1½"

CORNER RADIUS = 1½"

BLACK LEGEND AND BORDER ON A RETRO-REFLECTORIZED WHITE BACKGROUND.



M1-10

24" × 24"

MARGIN = NONE

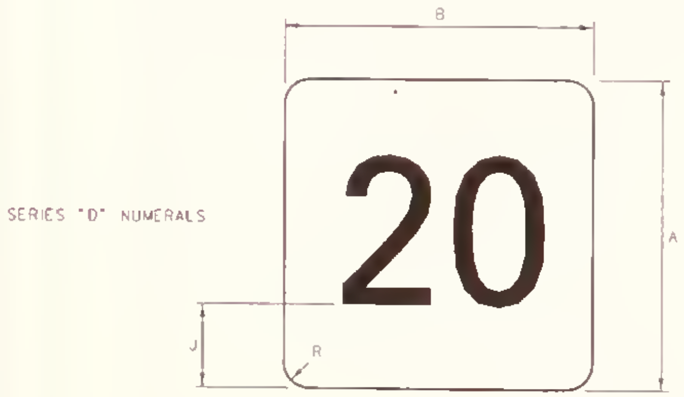
BORDER = SEE DESIGN ABOVE

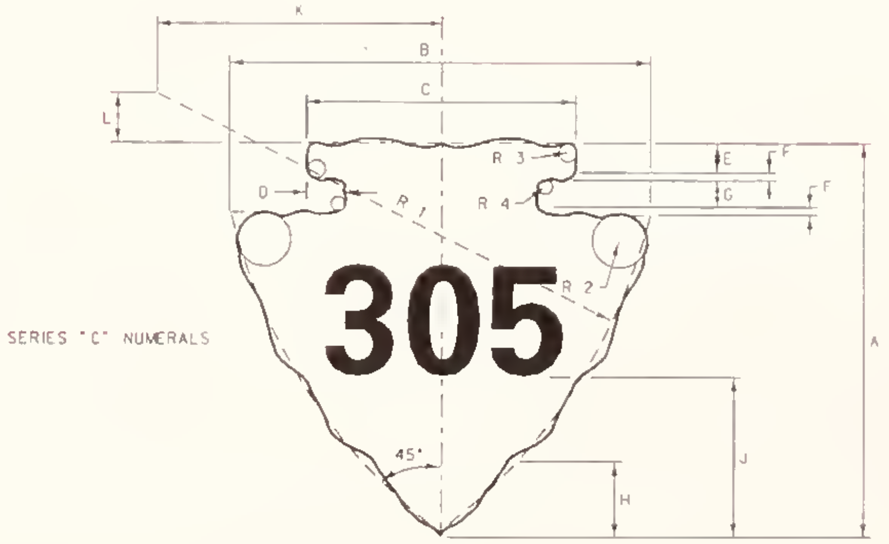
CORNER RADIUS = 1½"

BLACK LEGEND AND BORDER ON A RETRO-REFLECTORIZED WHITE BACKGROUND.

SHIELDS

FOR USE ON GUIDE SIGNS





NOTES:

CENTER ALL NUMERALS USED ON PANELS AND SHIELDS OPTICALLY ABOUT VERTICAL CENTERLINE.

SEE SIGNS AND SIGNING MATERIALS CATALOG FOR COMPLETE LISTING OF SIGNS AND SIGN SIZES. DESIGNS ARE AVAILABLE FROM THE TRAFFIC UNIT FOR SIGNS UNIQUE TO MONTANA.

	10" NUMERALS		12" NUMERALS		18" NUMERALS	
	2 DIGIT	3 DIGIT	2 DIGIT	3 DIGIT	2 DIGIT	3 DIGIT
A	21"	21"	24"	24"	36"	36"
B	24"	30"	24"	30"	36"	45"
J	6"	6"	6½"	6½"	9½"	9½"
R	1½"	1½"	2"	2"	2½"	2½"

BLACK LEGEND ON A RETRO-REFLECTORIZED WHITE BACKGROUND WITH NO BORDER.

												RADII			
	A	B	C	D	E	F	G	H	J	K	L	R 1	R 2	R 3	R 4
* 8" NUMERALS	26"	28"	18½"	2⅝"	3"	5⁄16"	2"	5½"	11"	17"	2¼"	32"	1¾"	⅝"	5⁄16"
** 10" NUMERALS	32"	34"	22½"	3¼"	3⅝"	⅜"	2½"	6¾"	13¾"	20½"	2"	38½"	2"	¾"	⅜"
*** 12" NUMERALS	40"	42"	28"	4"	4½"	½"	3"	8 7⁄16"	17"	25"	2⅞"	48"	2½"	1"	½"

BLACK LEGEND ON A RETRO-REFLECTORIZED WHITE BACKGROUND.

* USE WITH STANDARD 24" U. S. SHIELD.

** USE WITH STANDARD 30" AND 36" U. S. SHIELD.

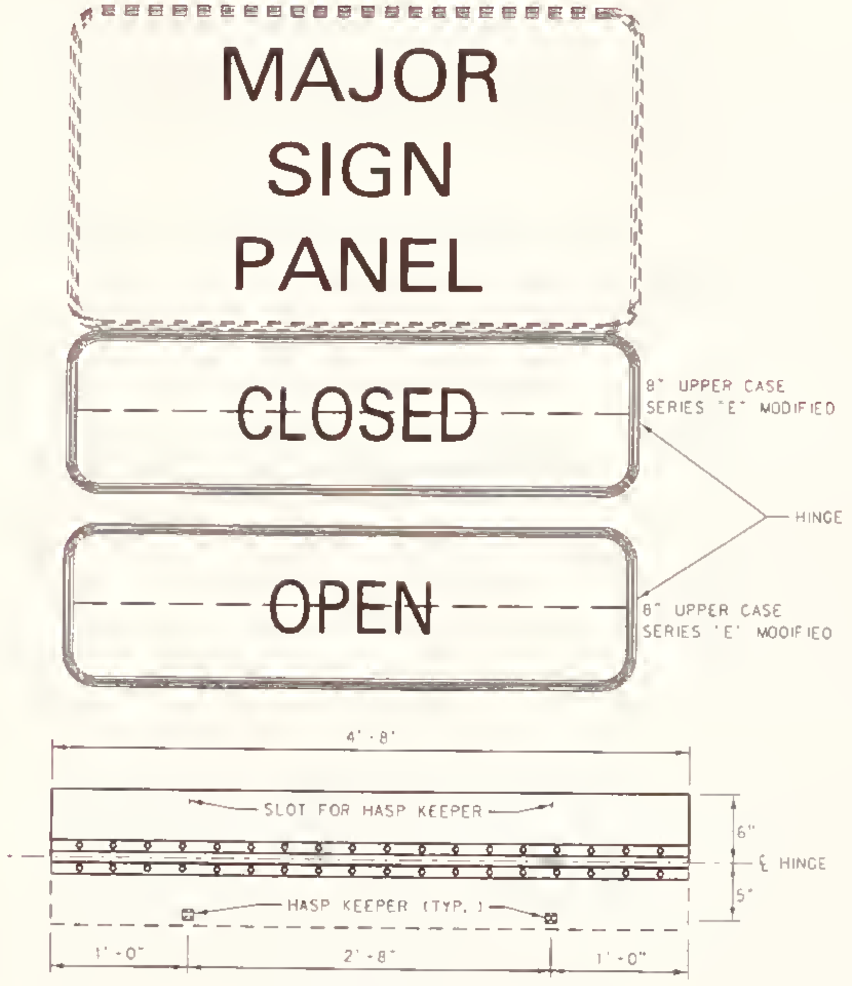
*** USE WITH STANDARD 42" U. S. SHIELD AND ALL INDEPENDENT USE.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 619
DWG. NO.
619-26

SPECIAL DESIGN
ROUTE MARKER
PANELS AND SHIELDS

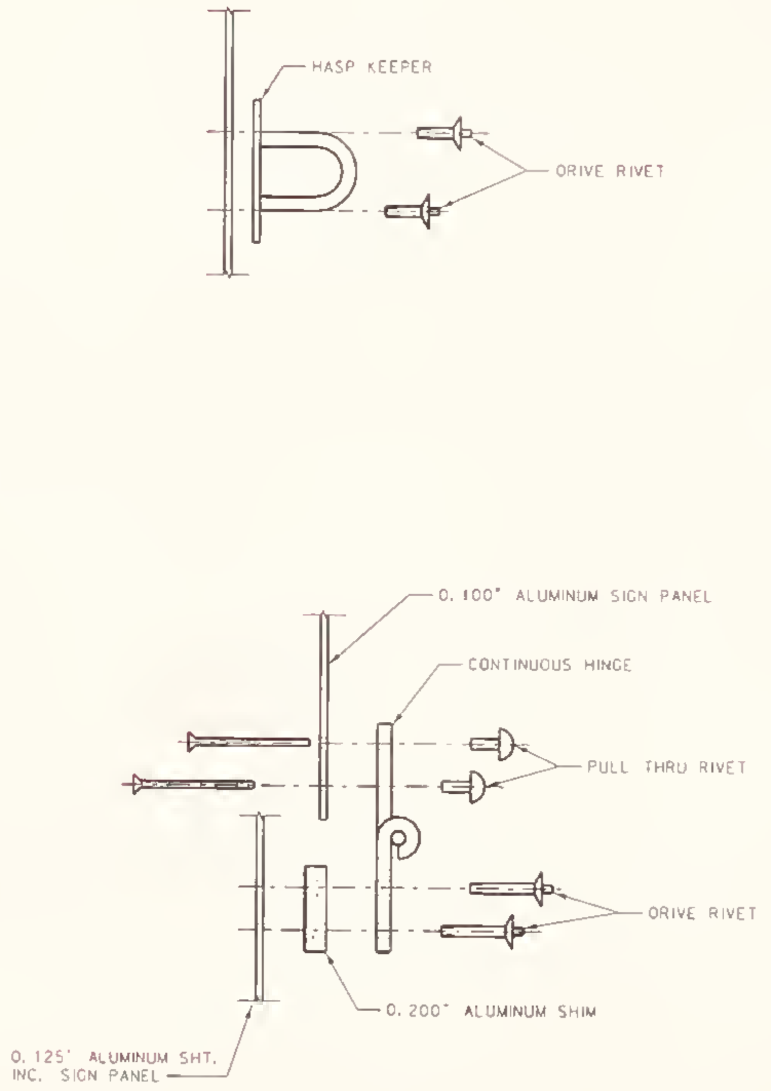
EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

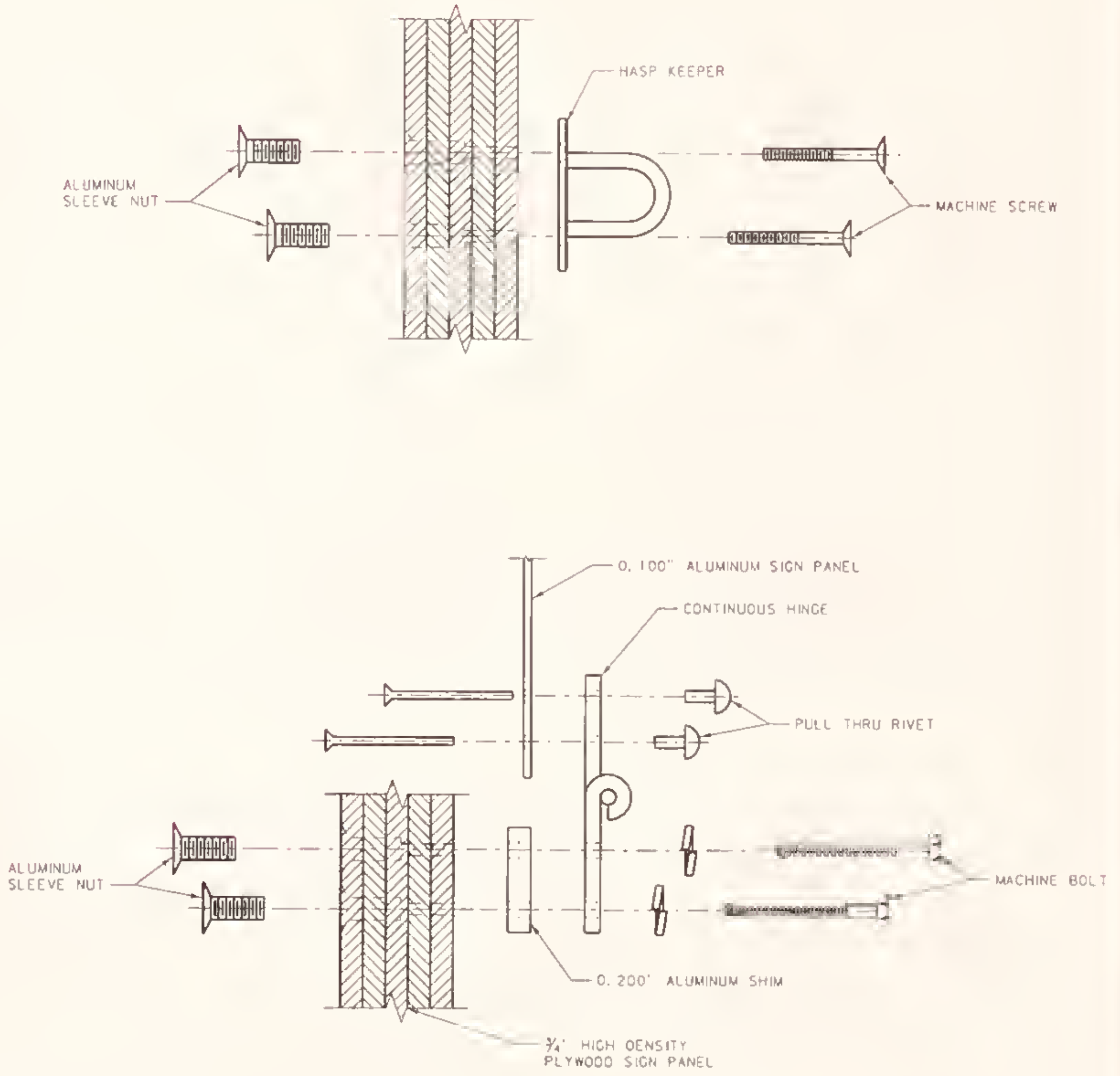


HINGE DETAIL
EXAMPLE
(5'-6" x 4'-0" D8-2A WEIGH STATION SIGN SHOWN)

ALUMINUM SHEET MOUNTING



PLYWOOD MOUNTING



NOTES:

SEE SIGNS AND SIGNING MATERIALS CATALOG FOR COMPLETE LISTING OF SIGNS AND SIGN SIZES. DESIGNS ARE AVAILABLE FROM THE TRAFFIC UNIT FOR SIGNS UNIQUE TO MONTANA.

THE SIGN PANEL CONSISTS OF ¾" HIGH DENSITY PLYWOOD OR 0.125" ALUMINUM SHEET INCREMENT AS SPECIFIED ON THE PLANS. THE HINGED PANEL CONSISTS OF 0.100" SHEET ALUMINUM.

PAINT ALL HARDWARE VISIBLE ON THE SIGN FACE OR COVER WITH RETRO-REFLECTIVE SHEETING, THE SAME COLOR AS THE SIGN.

SUBMIT SHOP DRAWINGS FOR APPROVAL PRIOR TO FABRICATION.

SUPPLEMENTAL SIGN PANEL BELOW MAJOR SIGN PANEL MUST HAVE RETRO-REFLECTORIZED LEGEND AND BACKGROUND MATCHING COLORS OF MAJOR PANEL.

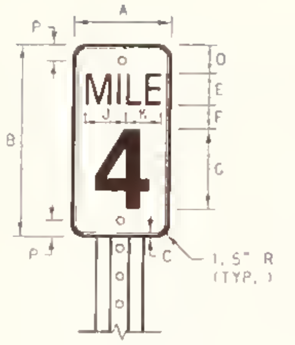
THE MINIMUM MOUNTING HEIGHT TO THE BOTTOM OF THE SECONDARY PANEL IS 5'-0".

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 619, 704
DWG. NO.
619-30

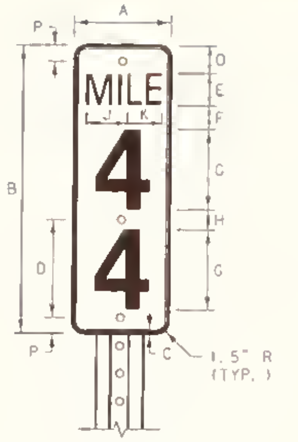
SIGN HINGE
DETAILS

EFFECTIVE: AUGUST 1999

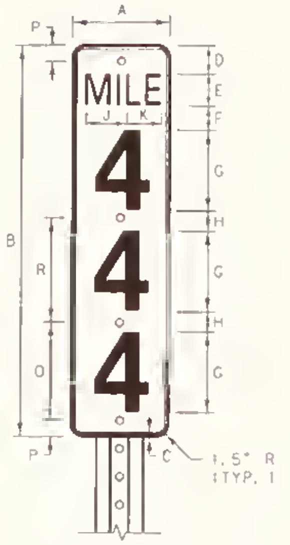
MONTANA DEPARTMENT
OF TRANSPORTATION
MONTANA
CADD



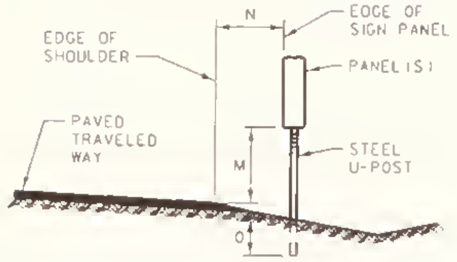
D10-1 AND D10-4



D10-2 AND D10-5



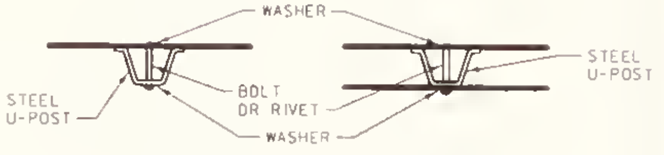
D10-3 AND D10-6



DIMENSION	INTERSTATE	NON-INTERSTATE
M	4'	4'
N	6'	2' TO 6' *
O	2' MIN.	2' MIN.

* NORMALLY IN LINE WITH DELINEATORS

TYPICAL PLACEMENT



SINGLE PANEL

DOUBLE PANEL

TYPICAL PANEL MOUNTING

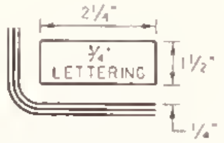
PANEL DIMENSION INFORMATION

INTERSTATE			
DIMENSION	D10-4 (1 DIGIT)	D10-5 (2 DIGIT)	D10-6 (3 DIGIT)
A	12.0"	12.0"	12.0"
B	24.0"	36.0"	48.0"
C	0.5"	0.5"	0.5"
D	3.5"	3.0"	3.0"
E	4.0" SERIES "C"	4.0" SERIES "C"	4.0" SERIES "C"
F	3.0"	3.0"	3.0"
G ®	10.0" SERIES "C"	10.0" SERIES "C"	10.0" SERIES "C"
H	~	3.0"	2.5"
J	4.6"	4.6"	4.6"
K	4.8"	4.8"	4.8"
P	2.0"	2.0"	2.0"
D	~	13.0"	12.0"
R	~	~	13.0"

NON-INTERSTATE			
DIMENSION	D10-1 (1 DIGIT)	D10-2 (2 DIGIT)	D10-3 (3 DIGIT)
A	10.0"	10.0"	10.0"
B	18.0"	27.0"	36.0"
C	0.5"	0.5"	0.5"
D	2.0"	2.0"	2.0"
E	4.0" SERIES "B"	4.0" SERIES "B"	4.0" SERIES "B"
F	2.0"	2.0"	2.0"
G ®	6.0" SERIES "C"	6.0" SERIES "C"	6.0" SERIES "C"
H	~	3.0"	3.0"
J	3.6"	3.6"	3.6"
K	3.8"	3.8"	3.8"
P	1.5"	1.5"	1.5"
D	~	10.0"	10.0"
R	~	~	9.0"

® OPTICALLY CENTER DIGITS ON VERTICAL ℄ OF PANEL.

P001	PRIMARY
S201	SECONDARY
I015	INTERSTATE



ROUTE IDENTIFICATION STICKERS

ON NEW SIGNING PROJECTS, FURNISH AND PLACE ROUTE NUMBER IDENTIFICATION STICKERS UPON BACKS OF ALL SIGNS BEFORE FINAL ACCEPTANCE OF THE PROJECT.

PLACE THE STICKER DISPLAYING THE FEDERAL AID ROUTE NUMBER IN THE LOWER LEFT CORNER OF THE MILEPOST SIGN, NEAREST THE EDGE OF THE ROADWAY.

NOTES:

MILEPOST PANELS CONSIST OF A RETRO-REFLECTORIZED WHITE LEGEND AND BORDER ON A RETRO-REFLECTORIZED GREEN BACKGROUND.

MOUNT ALL MILEPOSTS ON STEEL U-POSTS (MIN. 2 LB./FT.) EXCEPT THE D10-6, WHICH IS MOUNTED ON A STEEL U-POST (MIN. 3 LB./FT.) AS NOTED IN THE SIGNING PLANS.

USE GALVANIZED OR CADMIUM PLATED 5/16" DIA. BOLT, NUT AND WASHER, AND JAM THREADS AFTER TIGHTENING. USE 5/16" DIA. ALUMINUM OR CADMIUM PLATED BOLT RIVETS OR PAINT RIVET HEADS WITH BRILLIANT GREEN SIGN ENAMEL.

DO NOT RELOCATE OR MOVE A MILEPOST ONCE IT HAS BEEN PROPERLY PLACED.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 619
DWG. NO.
619-32

MILEPOST DETAILS

EFFECTIVE: AUGUST 1999

MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

DESIGN A USAGE:
USE FOR CONTINUOUS DELINEATION AND RT. SHOULDER OF ALL ROUTES.

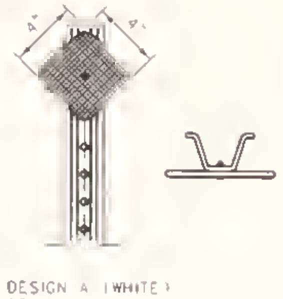
DESIGN H USAGE:
USE ON LT. SHOULDER OF INTERSTATE ROUTES.

DESIGN B USAGE:
USE ON LT. SHOULDER OF INTERSTATE RAMPS.

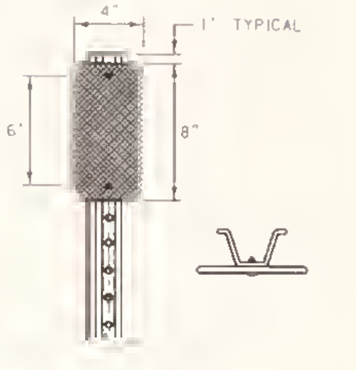
DESIGN G USAGE:
USE ON RT. SHOULDER OF INTERSTATE RAMPS.

DESIGN J USAGE:
USE FOR TRUCK ESCAPE RAMPS ONLY.

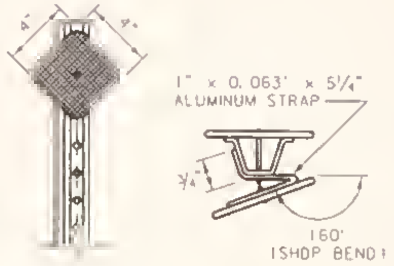
DESIGN C USAGE:
USE FOR 10' CURVES AND GREATER, BOTH OUTSIDE AND INSIDE OF CURVE.



DESIGN A (WHITE)
DESIGN H (YELLOW)



DESIGN B (YELLOW)
DESIGN G (WHITE)
DESIGN J (RED)

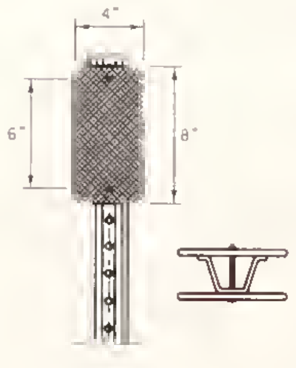


DESIGN C (WHITE)

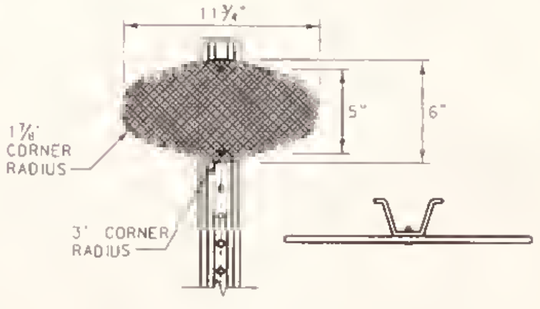
DESIGN D USAGE:
NON-INTERSTATE ROUTES:
USE AT APPROACHES WITH STOP OR YIELD SIGNS.
INTERSTATE ROUTES:
USE FOR RAMP TERMINATION AT CROSS ROAD.

DESIGN E USAGE:
SPECIAL USE ONLY.
FORMERLY USED AT GORES AND ISLAND NOSES.

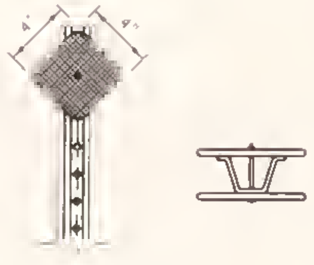
DESIGN F USAGE:
USE FOR CURVES LESS THAN 10°: 4° TO 7°29': OUTSIDE OF CURVE ONLY. 7°30' TO 10°: OUTSIDE AND INSIDE OF CURVE.



DESIGN D (YELLOW)



DESIGN E (YELLOW)



DESIGN F (WHITE)

DELINEATOR LEGEND	
DESIGN "A"	—|
DESIGN "B"	—||
DESIGN "C"	⊢—⊣
DESIGN "D"	||—||
DESIGN "E"	—|||
DESIGN "F"	|—|
DESIGN "G"	—<
DESIGN "H"	—▷
DESIGN "J"	—×

NOTE:
SOME TYPICAL USES ARE SHOWN FOR EACH DESIGN. REFER TO THE MUTCD FOR SPECIFIC GUIDANCE.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 619
DWG. NO.
619-34

DELINEATOR DETAILS

EFFECTIVE: AUGUST 1999

MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

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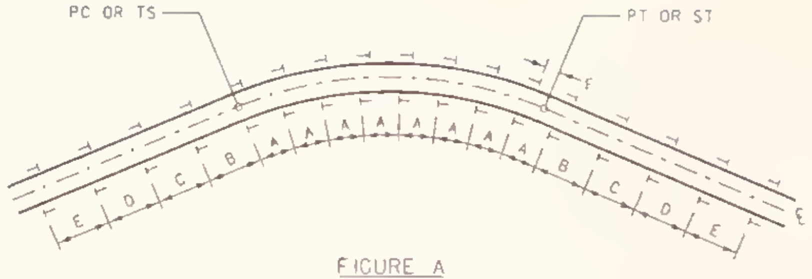

FIGURE A

SEE TABLE BELOW FOR SPACING VALUES

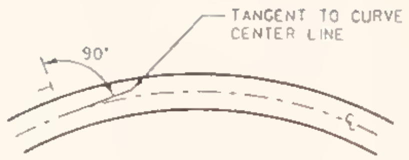

FIGURE B

HORIZONTAL CURVE SPACING TABLE					
DEGREE OF CURVE	SPACING ON CURVE	SPACING ON BOTH APPROACH TANGENTS			
	A	B	C	D	E
0° + TO 30'	300'	400'	400'	400'	400'
30' + TO 1°	300'	400'	400'	400'	400'
1° + TO 2°	225'	400'	400'	400'	400'
2° + TO 3°	160'	320'	400'	400'	400'
3° + TO 4°	130'	260'	400'	400'	400'
4° + TO 6°	110'	220'	330'	400'	400'
6° + TO 8°	90'	185'	275'	400'	400'
8° + TO 12°	75'	150'	230'	300'	400'
12° + TO 20°	60'	125'	185'	300'	400'
20° PLUS	45'	90'	140'	275'	400

NOTES:

FURNISH RETRO-REFLECTIVE SHEETING ACCORDING TO THE STANDARD SPECIFICATIONS FOR RETRO-REFLECTIVE SHEETING B (HIGH INTENSITY). POSITION DELINEATOR FACES PERPENDICULAR TO TANGENT TO CENTERLINE OF CURVE AS SHOWN IN FIGURE B.

MOUNT DELINEATORS ON METAL U-POSTS (MIN. 1.12 LB./FT.) WITH 5/16" DIA. CADMIUM PLATED BOLT(S). DRILL OR PUNCH A MINIMUM OF TWELVE 3/8" MAXIMUM DIAMETER HOLES ON 1 INCH CENTERS FROM THE TOP OF THE POST. 1/4" SQUARE HOLES MAY BE USED. IF SQUARE HOLES ARE USED, USE A LARGE HEADED BOLT OR AN APPROPRIATE WASHER. JAM THREADS AFTER TIGHTENING THE NUT TO PREVENT REMOVAL.

PLACE DELINEATORS AT A CONSTANT CLEARANCE DISTANCE FROM THE EDGE OF THE PAVEMENT EXCEPT WHERE GUARDRAIL OR OTHER OBSTRUCTIONS INTERFERE. ALIGN THE DELINEATORS WITH THE INSIDE EDGE OF THE OBSTRUCTION. CLEARANCE FOR DELINEATORS IS 6'-0" ON INTERSTATE HIGHWAYS, 2'-0" TO 6'-0" ON PRIMARY AND SECONDARY HIGHWAYS OR AS DETERMINED BY THE ENGINEER. THE STANDARD MOUNTING HEIGHT IS 4'-0" TO THE TOP OF THE POST. SUPPLY POST LENGTHS TO MAINTAIN THE PROPER MOUNTING HEIGHT AND A MINIMUM OF 18" EMBEDMENT.

SPACE DELINEATORS ACCORDING TO THE DISTANCES FOUND IN THE TABLE ABOVE OR AS SPECIFIED IN THE PLANS. IN FIGURE A, IF 'F' IS GREATER THAN 20' ADD ONE REGULAR DELINEATOR IN AT 'A' SPACING. UNDER NORMAL SPACING, SHOULD A DELINEATOR FALL WITHIN A CROSSROAD OR APPROACH, IT MAY BE MOVED IN EITHER DIRECTION A DISTANCE NOT TO EXCEED ONE QUARTER OF THE NORMAL SPACING. ELIMINATE DELINEATORS STILL FALLING IN SUCH AREAS.

ALL DELINEATOR REFLECTORS HAVE 3/4" CORNER RADII EXCEPT DESIGN "E".

MOUNT THE DELINEATOR REFLECTOR 1" BELOW THE TOP OF THE METAL U-POST.

WHEN THE ROADWAY ADT IS LESS THAN 900, DELINEATE ALL CURVES WITH DEGREE OF CURVATURE OF 4° OR GREATER.

CONTINUOUSLY DELINEATE ROADWAYS WHEN THE ADT IS 900 AND GREATER, OR BY ENGINEERING JUDGEMENT.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 619.704
DWG. NO.
619-36

DELINEATOR PLACEMENT
DETAILS

EFFECTIVE: AUGUST 1999

MDT MONTANA DEPARTMENT OF TRANSPORTATION
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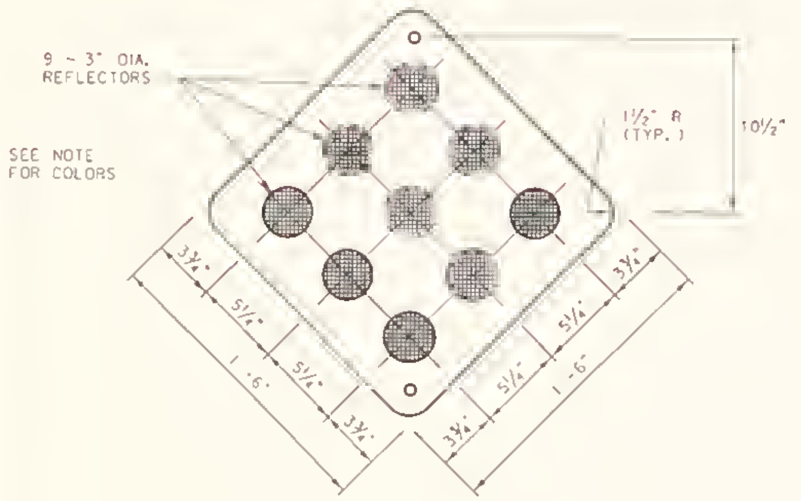
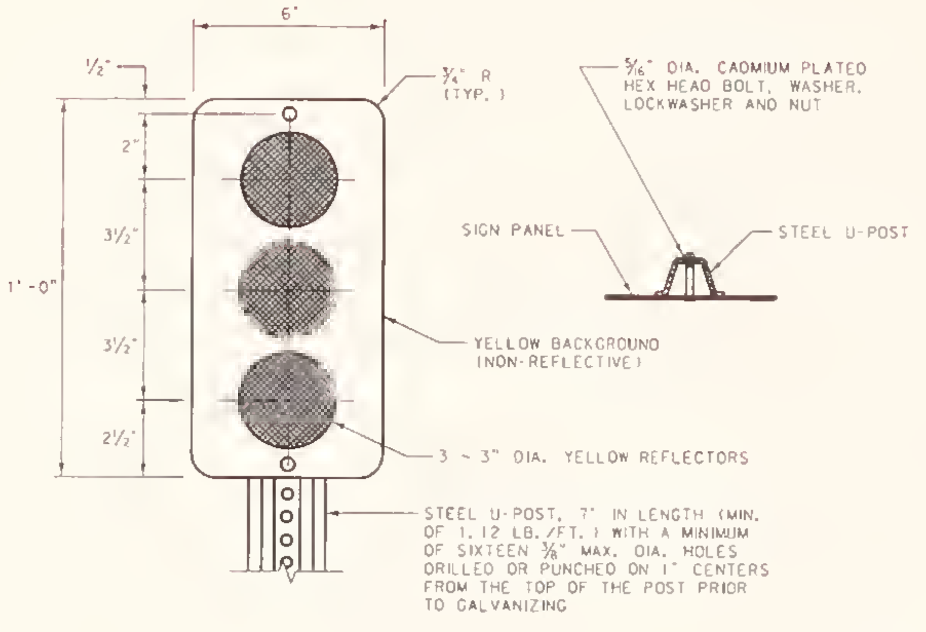
TYPE 1
X3-2



NOTE:
TYPE 1 OBJECT MARKERS HAVE YELLOW REFLECTORS ON A YELLOW OR BLACK BACKGROUND OR AN ALL YELLOW RETRO-REFLECTORIZED PANEL OF THE SAME SIZE. IF USED AS END OF ROAD MARKERS, TYPE 1 MARKERS ARE RETRO-REFLECTORIZED RED OR HAVE RED REFLECTORS ON A RED OR BLACK BACKGROUND.

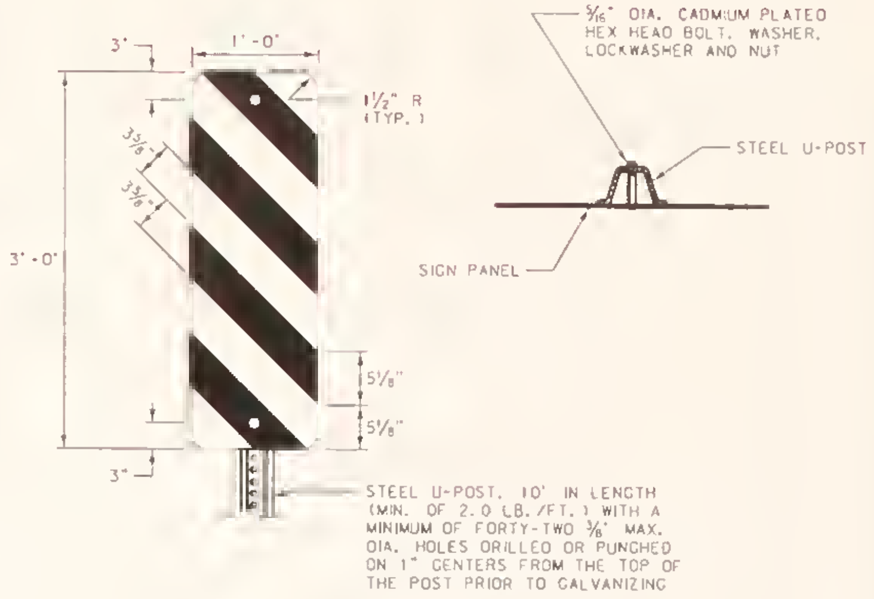
TYPE 2
X3-3


6"
½"
¾" R (TYP.)
2"
3½"
3½"
2½"
1'-0"
⁵⁄₁₆" DIA. CADMIUM PLATED HEX HEAD BOLT, WASHER, LOCKWASHER AND NUT
SIGN PANEL
STEEL U-POST
YELLOW BACKGROUND (NON-REFLECTIVE)
3 ~ 3" DIA. YELLOW REFLECTORS

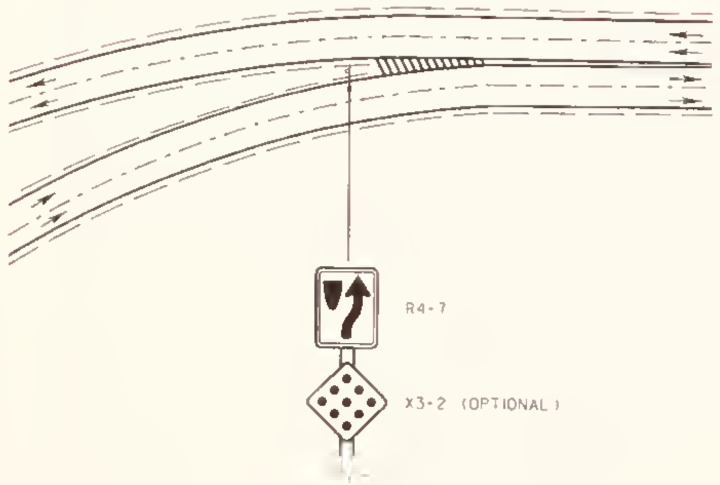
STEEL U-POST, 7' IN LENGTH (MIN. OF 1.12 LB./FT.) WITH A MINIMUM OF SIXTEEN ⅜" MAX. DIA. HOLES DRILLED OR PUNCHED ON 1" CENTERS FROM THE TOP OF THE POST PRIOR TO GALVANIZING

ALTERNATE DESIGN FOR TYPE 2 OBJECT MARKERS IS A YELLOW RETRO-REFLECTORIZED PANEL OF THE SAME SIZE.

TYPE 3
OM-3
(OM-3L SHOWN)

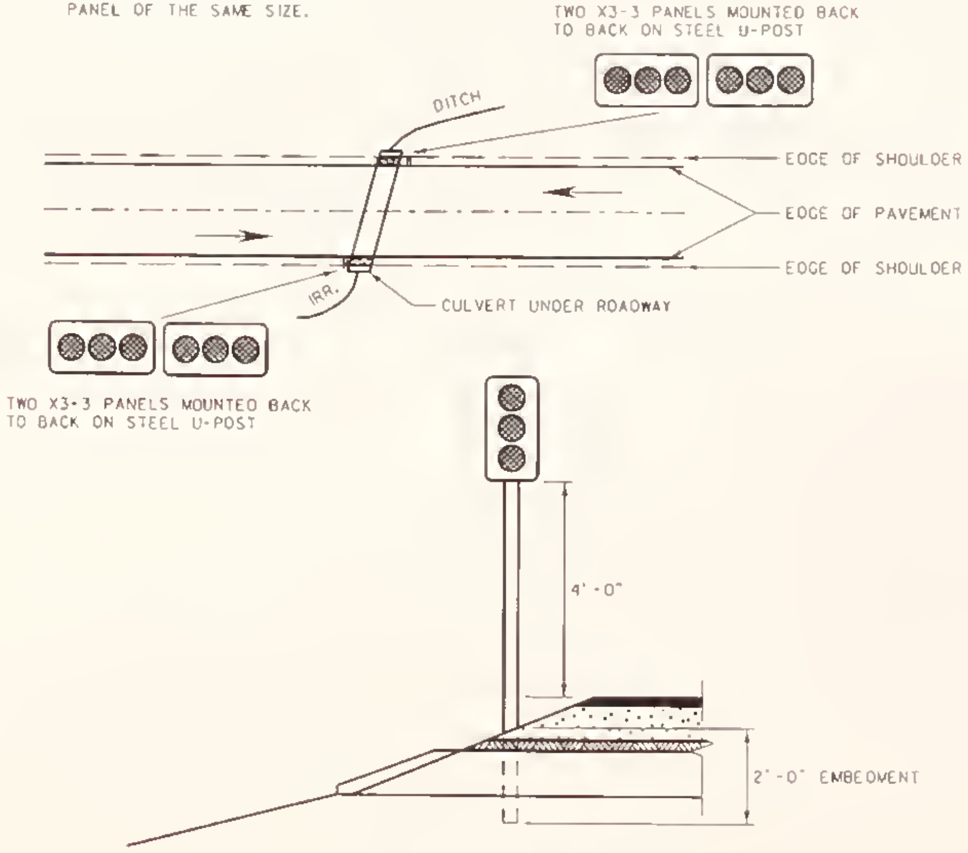

3"
1'-0"
1½" R (TYP.)
3⅝"
3⅝"
3'-0"
5⅛"
5⅛"
3"
⁵⁄₁₆" DIA. CADMIUM PLATED HEX HEAD BOLT, WASHER, LOCKWASHER AND NUT
STEEL U-POST
SIGN PANEL

STEEL U-POST, 10' IN LENGTH (MIN. OF 2.0 LB./FT.) WITH A MINIMUM OF FORTY-TWO ⅜" MAX. DIA. HOLES DRILLED OR PUNCHED ON 1" CENTERS FROM THE TOP OF THE POST PRIOR TO GALVANIZING



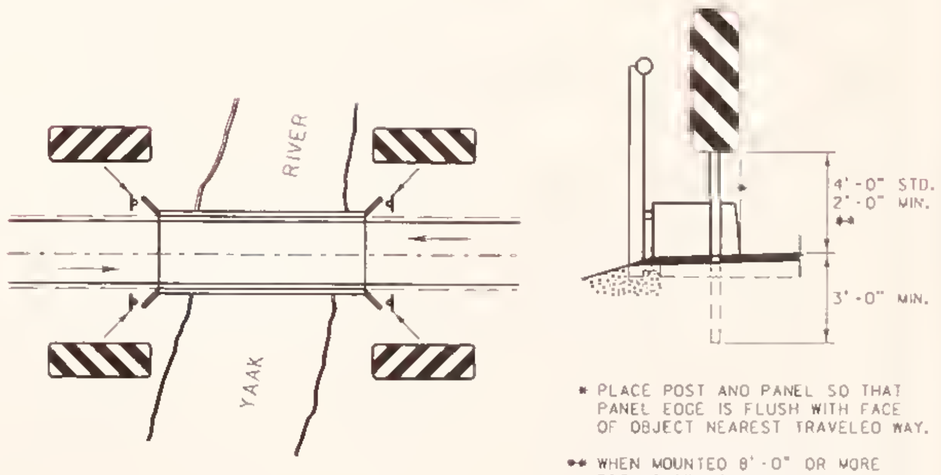
TYPICAL USE AND PLACEMENT

PLACEMENT OF X3-2 IS USED ONLY AS OPTIONAL TO ENHANCE TARGET VALUE WHEN NEEDED.


TWO X3-3 PANELS MOUNTED BACK TO BACK ON STEEL U-POST
DITCH
EDGE OF SHOULDER
EDGE OF PAVEMENT
EDGE OF SHOULDER
IRR.
CULVERT UNDER ROADWAY
TWO X3-3 PANELS MOUNTED BACK TO BACK ON STEEL U-POST
4'-0"
2'-0" EMBEDMENT

PLACE POST AND PANEL(S) SO THAT PANEL(S) ARE DIRECTLY ADJACENT TO INNER-MOST EDGE OF OBJECT NEAREST TRAVELED WAY.

TYPICAL USE AND PLACEMENT



* PLACE POST AND PANEL SO THAT PANEL EDGE IS FLUSH WITH FACE OF OBJECT NEAREST TRAVELED WAY.

** WHEN MOUNTED 8'-0" OR MORE FROM CURB OR SHOULDER, THE MOUNTING HEIGHT IS MEASURED FROM THE GROUND LINE INSTEAD OF THE EDGE OF PAVEMENT.

TYPICAL USE AND PLACEMENT

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 619
DWG. NO.
619-38

OBJECT MARKER DESIGN AND
PLACEMENT DETAILS FOR OBSTRUCTIONS
ADJACENT TO OR WITHIN HIGHWAYS

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

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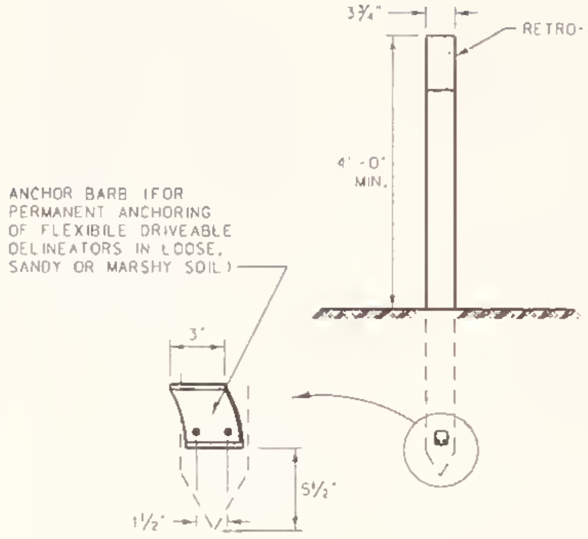
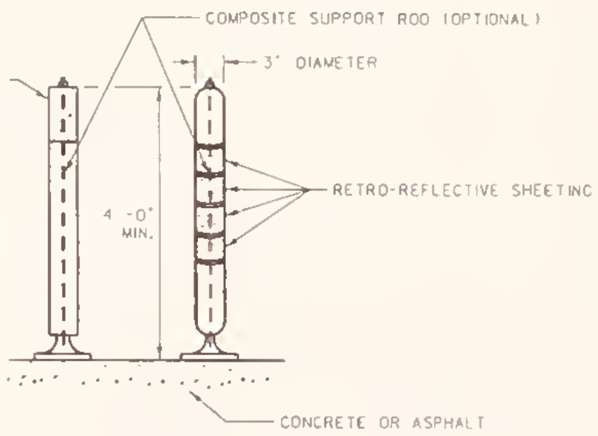

3¾"
RETRO-REFLECTIVE SHEETING
4'-0"
MIN.
ANCHOR BARB (FOR PERMANENT ANCHORING OF FLEXIBILE DRIVEABLE DELINEATORS IN LOOSE, SANDY OR MARSHY SOIL)
3"
5½"
1½"

FLEXIBLE DRIVEABLE
DELINEATORS


COMPOSITE SUPPORT ROD (OPTIONAL)
3" DIAMETER
RETRO-REFLECTIVE SHEETING
4'-0"
MIN.
RETRO-REFLECTIVE SHEETING
CONCRETE OR ASPHALT

DETAILS ARE REPRESENTATIVE ONLY. ACTUAL DESIGN USED/SPECIFIED MAY VARY (SEE PLANS).

FLEXIBLE SURFACE-MOUNTED
DELINEATORS

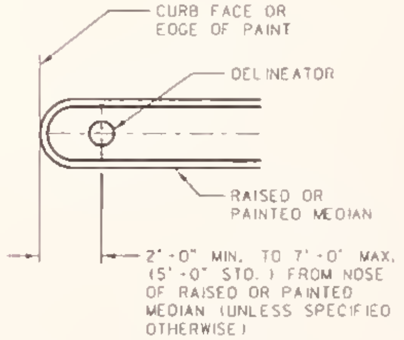
NOTES:

USE FLEXIBLE DELINEATORS SIMILAR TO THE DESIGN AND SPECIFICATIONS SHOWN ON THIS SHEET OR IN THE SIGNING PLANS OF THE CONTRACT.

MOUNT OR EMBED FLEXIBLE DELINEATORS TO THE MANUFACTURER'S SPECIFICATIONS.

RETRO-REFLECTORIZE FLEXIBLE DELINEATORS, IF REQUIRED IN PLAN SPECIFICATIONS, BY THE ADDITION OF DELINEATOR CRYSTALS, EITHER 1½" x 7" OR 3" DIAMETER, OR BY ADDING TWO 3" MINIMUM WIDTH BANDS OF RETRO-REFLECTIVE SHEETING TYPE HI, 360° AROUND THE TOP OF THE DELINEATOR. USE THE COLOR OF THE DELINEATOR CRYSTALS OR RETRO-REFLECTORIZED MATERIAL AS SHOWN IN THE SIGNING PLANS OF THE CONTRACT OR THE MUTCD.

THE EXACT LOCATION AND PLACEMENT OF THE FLEXIBLE DELINEATORS ARE SHOWN IN THE SIGNING PLANS.


CURB FACE OR EDGE OF PAINT
DELINEATOR
RAISED OR PAINTED MEDIAN
2'-0" MIN. TO 7'-0" MAX. (5'-0" STD.) FROM NOSE OF RAISED OR PAINTED MEDIAN (UNLESS SPECIFIED OTHERWISE)

TYPICAL USE AND PLACEMENT

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 619
DWG. NO.
619-40

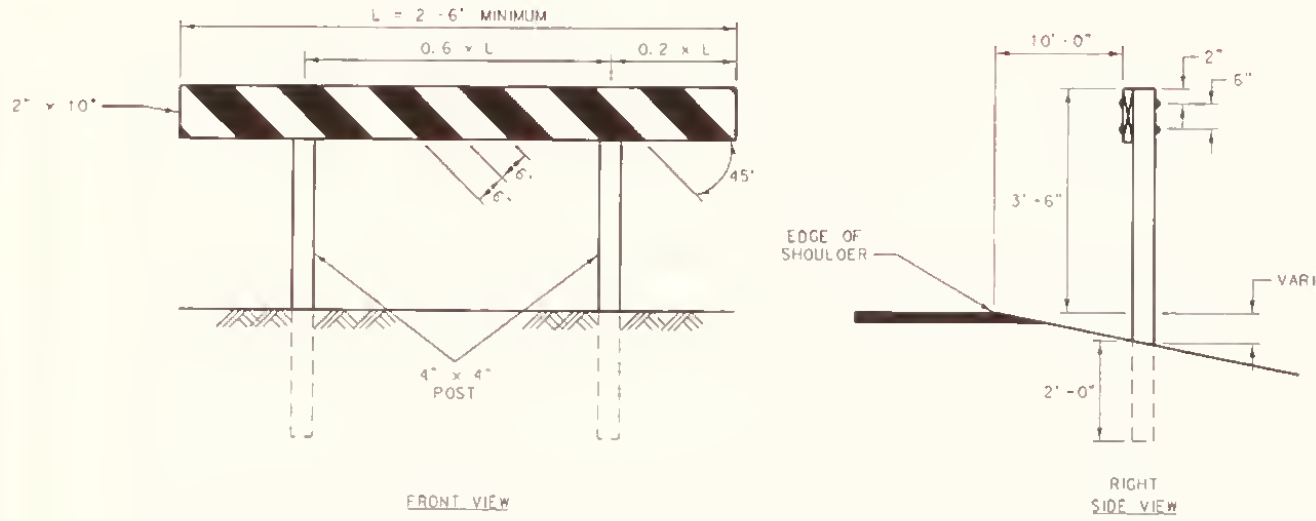
FLEXIBLE DELINEATORS

EFFECTIVE: AUGUST 1999

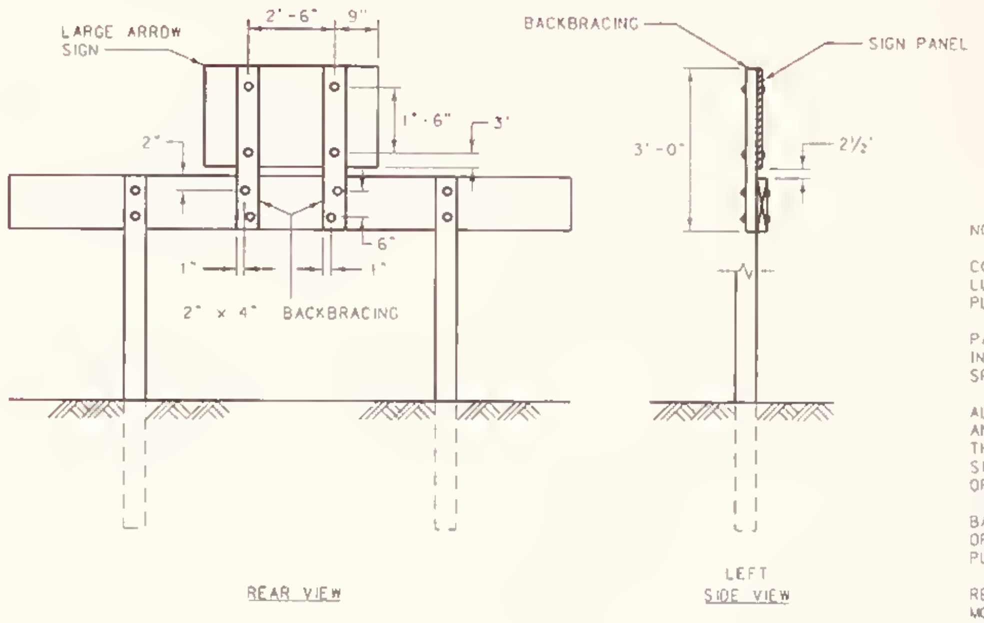
MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

BI BARRICADE

B(I)-L SHOWN



BARRICADE DETAILS



SIGN MOUNTING DETAILS

NOTES:

CONSTRUCT ALL BARRICADES OF COMMERCIAL GRADE S4S LUMBER. USE ⅜" DIA. GALVANIZED CARRIAGE OR CADMIUM PLATED BOLTS, WASHERS AND NUTS FOR ALL CONNECTIONS.

PAINT ALL BARRICADES WITH TWO COATS OF WHITE PAINT IN ACCORDANCE WITH SECTION 710 OF THE STANDARD SPECIFICATIONS.

ALL BARRICADES HAVE ALTERNATING RETRO-REFLECTIVE RED AND WHITE STRIPES, 6" IN WIDTH AT AN ANGLE OF 45° TO THE VERTICAL, SLANTING DOWNWARD TOWARD THE SIDE OR SIDES ON WHICH TRAFFIC IS TO FLOW. NOMINAL DIMENSIONS OF ROLL MATERIAL FOR STRIPES IS ACCEPTABLE.

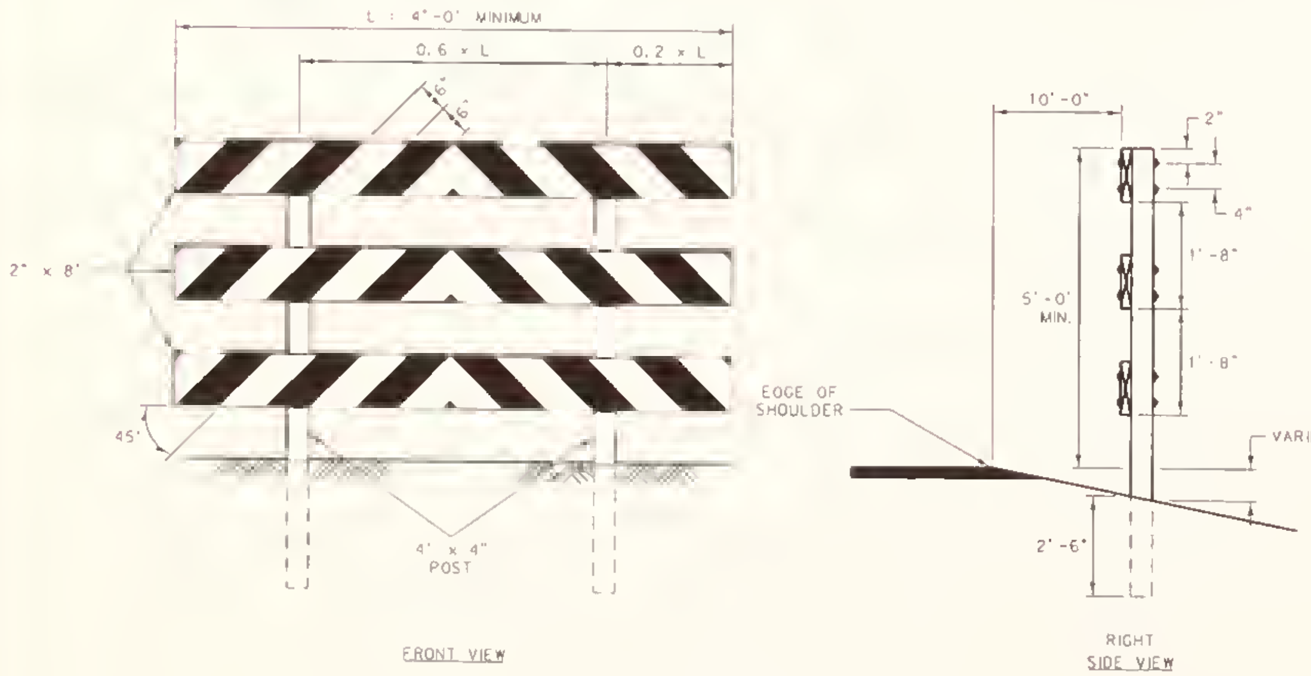
BARRICADES DESIGNATED "L" ARE PLACED ON THE LEFT SIDE OF APPROACHING TRAFFIC. BARRICADES DESIGNATED "R" ARE PLACED ON THE RIGHT SIDE OF APPROACHING TRAFFIC.

RETRO-REFLECTORIZE ALL BARRICADES WITH THE SHEETING MOUNTED ON A SHEET ALUMINUM BACKING AT LEAST 0.019" THICK. USE ALUMINUM ALLOY 6061-T6 OR AA5052-H38 CONFORMING TO ASTM DESIGNATION B 209. SECURE RETRO-REFLECTIVE ALUMINUM SHEETING WITH ALUMINUM NAILS.

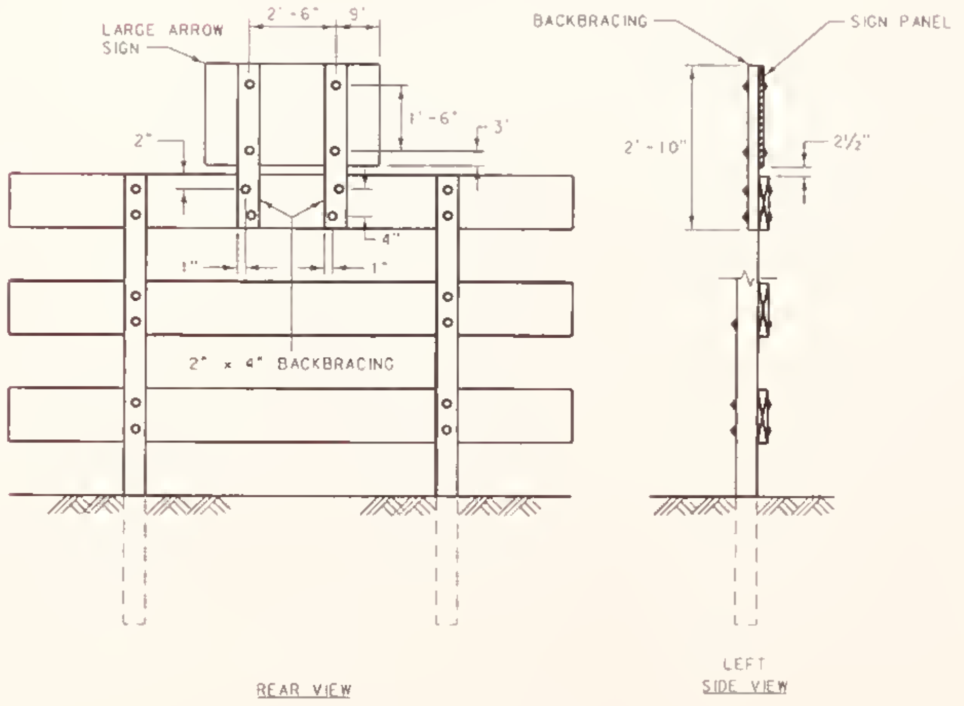
DETERMINE THE POST LENGTHS IN THE FIELD, COMPLYING WITH THE MOUNTING HEIGHTS AND FOUNDATION DEPTHS LISTED ON THIS SHEET.

BIII BARRICADE

B(III)-L & R SHOWN



BARRICADE DETAILS



SIGN MOUNTING DETAILS

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 619
DWG. NO.
619-42

PERMANENT BARRICADE
DESIGN DETAILS

EFFECTIVE: AUGUST 1999

MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

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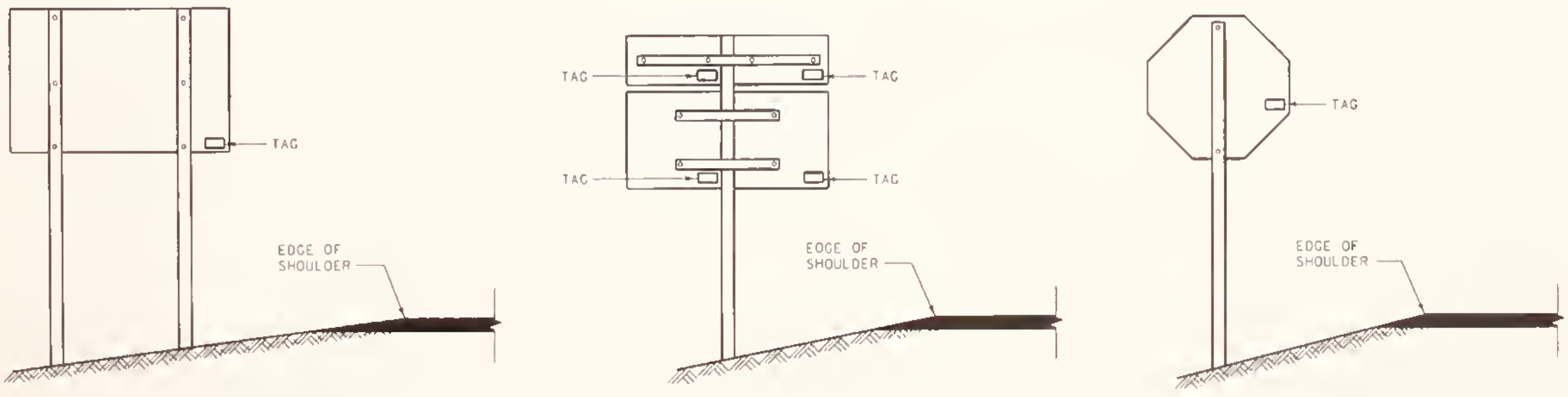
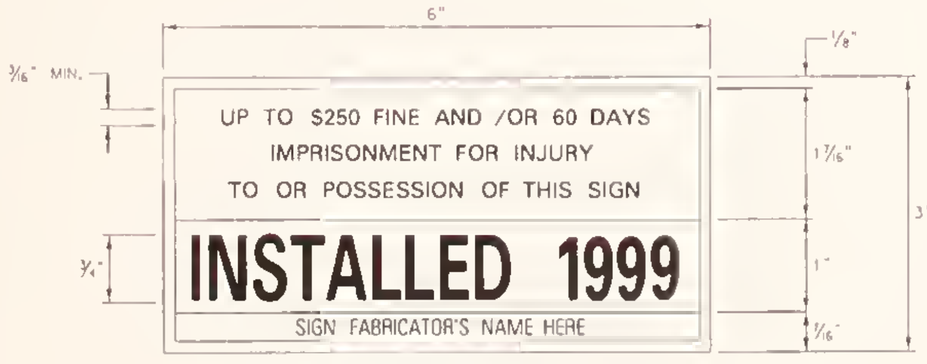


PLACEMENT DETAILS


6"
3/16" MIN.
UP TO $250 FINE AND /OR 60 DAYS
IMPRISONMENT FOR INJURY
TO OR POSSESSION OF THIS SIGN
INSTALLED 1999
SIGN FABRICATOR'S NAME HERE
3/4"
1/8"
1 7/16"
1"
1/16"
3"

DATE TAG DETAIL

DATE TAG COLOR SEQUENCE
DATE TAG COLOR CORRESPONDS TO THE LAST DIGIT OF THE INSTALLATION YEAR AS FOLLOWS:

0 - YELLOW
1 - WHITE
2 - LIGHT BLUE
3 - GOLD
4 - LIGHT GREEN
5 - RED
6 - PURPLE
7 - ORANGE
8 - BLUE
9 - GREEN

NOTES:

FURNISH AND PLACE INSTALLATION DATE TAGS ON ALL SIGNS PRIOR TO FINAL ACCEPTANCE OF THE PROJECT.

THE TAGS DISPLAY THE YEARS IN WHICH THE SIGNS WERE INSTALLED. SEE THE COLOR SEQUENCE TABLE SHOWN ON THIS DRAWING FOR THE APPROPRIATE COLORS. DATE TAGS ARE TO BE RETRO-REFLECTIVE.

PLACE A TAG ON THE BACK OF EACH SIGN, LOCATED NEAR THE LOWER CORNER OF THE SIGN NEAREST THE EDGE OF ROADWAY, TO BE VISIBLE FROM THE ROADWAY AS SHOWN IN THE EXAMPLES ABOVE.

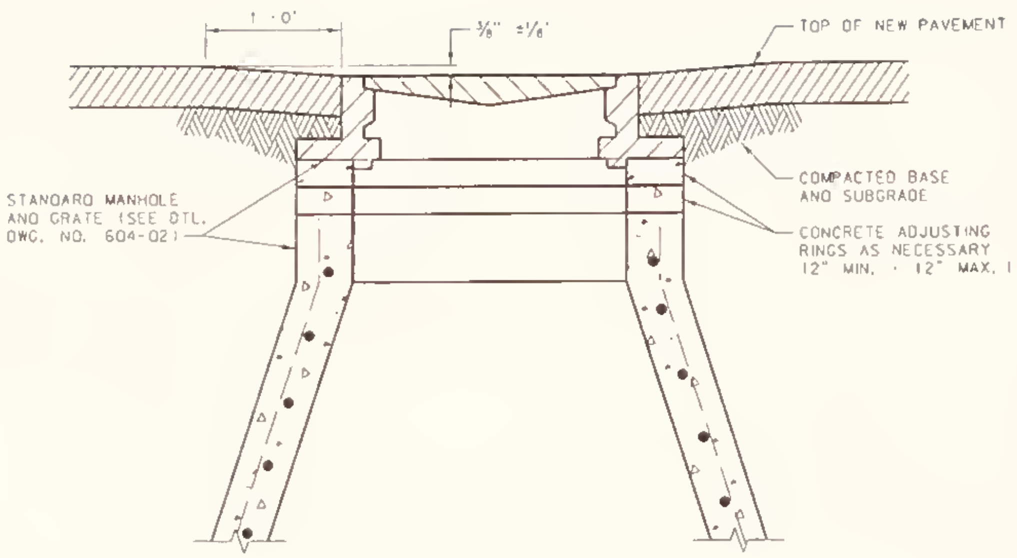
PLACE TAGS ON ANY NEW SIGN INSTALLED IN THE FIELD AS ROUTINE MAINTENANCE BY MDT FORCES. MAINTENANCE DESIGN DATE TAGS CAN BE ORDERED FROM THE SIGN SHOP IN HELENA.

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 619
DWG. NO.
619-44

INSTALLATION
DATE TAGS

EFFECTIVE: AUGUST 1999

MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD


1'-0"
3/8" ±1/8"
TOP OF NEW PAVEMENT
STANDARD MANHOLE AND GRATE (SEE DTL. DWG. NO. 604-02)
COMPACTED BASE AND SUBGRADE
CONCRETE ADJUSTING RINGS AS NECESSARY (2" MIN. - 12" MAX.)

NOTES:

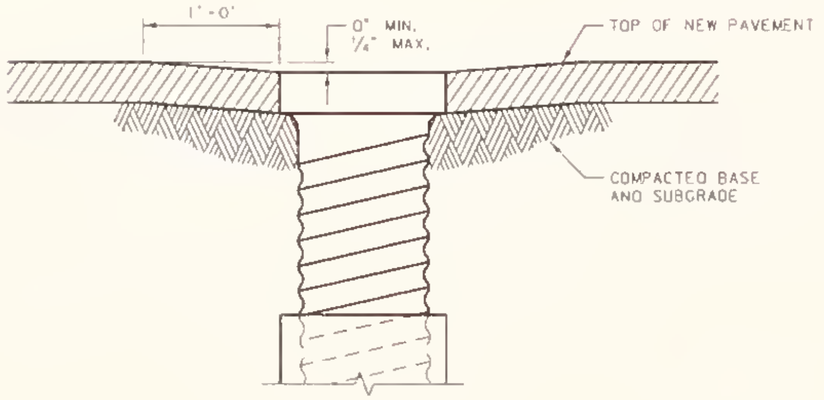
ADJUST MANHOLES UPWARD WITH ADJUSTING RINGS UNDER FRAME.

ADJUST MANHOLES DOWNWARD BY REMOVING CONE AND BARREL SECTIONS AS NECESSARY AND REPLACING WITH SECTIONS OF LENGTH REQUIRED TO MATCH GRADE.

SLOPE MANHOLE FRAME AS REQUIRED TO MATCH SLOPE OF STREET.

MAKE FINAL MANHOLE ADJUSTMENTS BEFORE PAVING.

MANHOLE ADJUSTMENT DETAIL



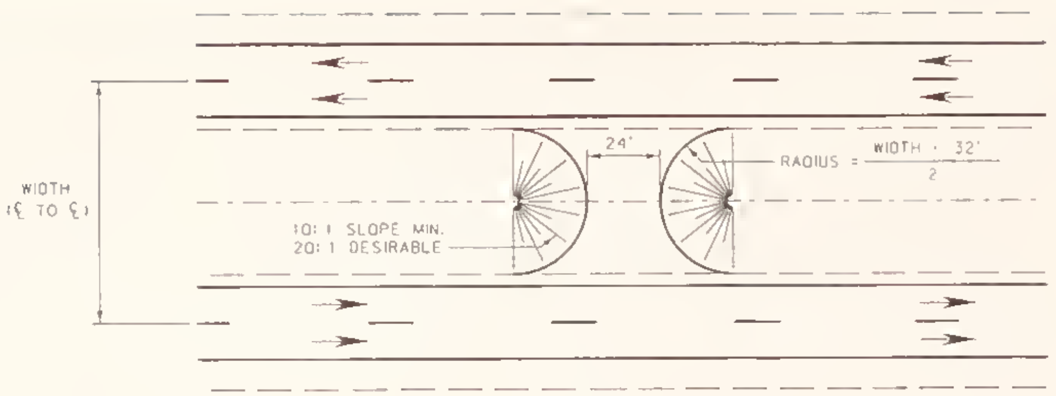
NOTES:

ADJUST WATER VALVES UPWARD OR DOWNWARD AS REQUIRED.

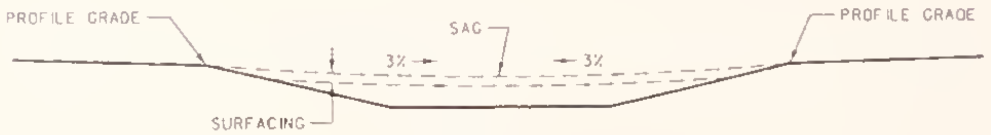
MAKE FINAL ADJUSTMENT BEFORE PAVING.

VALVE BOX ADJUSTMENT DETAIL

DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION 604, 621
DWG. NO.
621-00
MANHOLE AND
VALVE BOX
ADJUSTMENT DETAILS
EFFECTIVE: AUGUST 1999
MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD



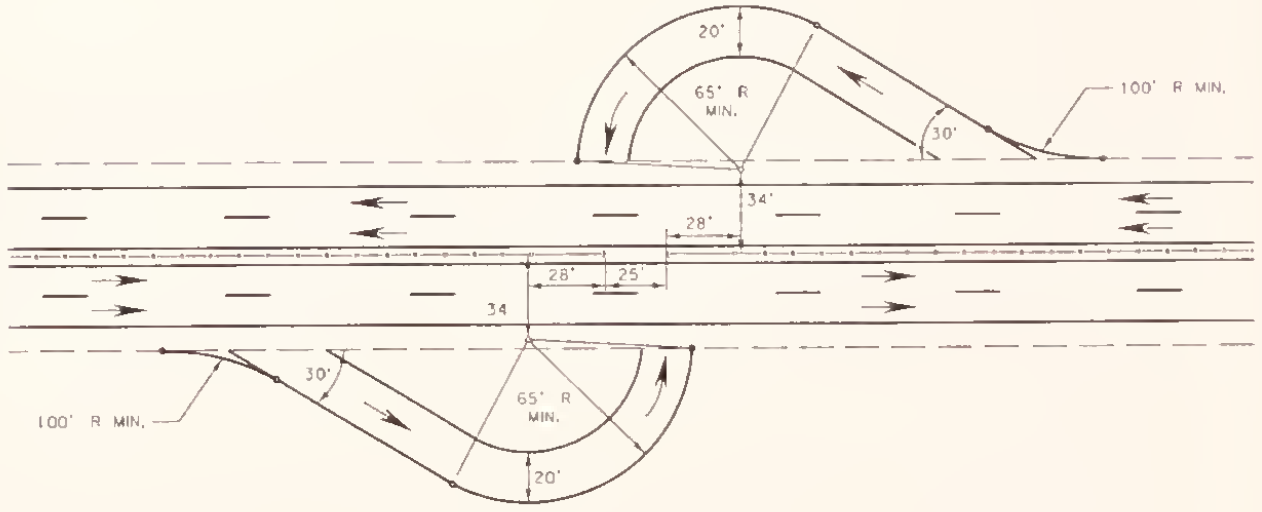
PLAN



PROFILE

MEDIAN WIDTHS 36' TO 76'

LOCATE AND CONSTRUCT TURNOUTS ABOVE IN CONJUNCTION WITH DITCH BLOCKS IF AT ALL POSSIBLE. PROVIDE DRAINAGE WHEN NECESSARY.



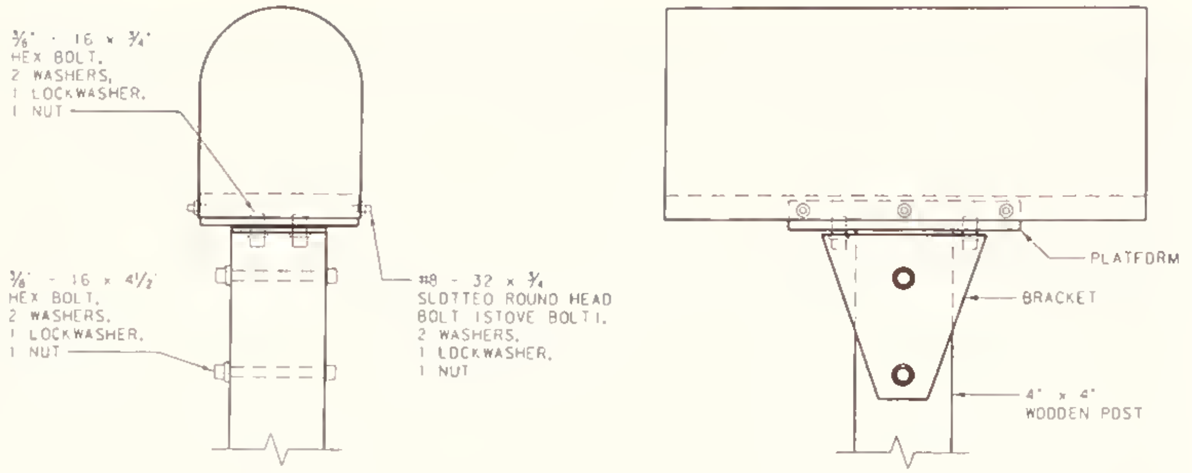
STANDARD U-TURN FOR NARROW MEDIANS

NOTES:

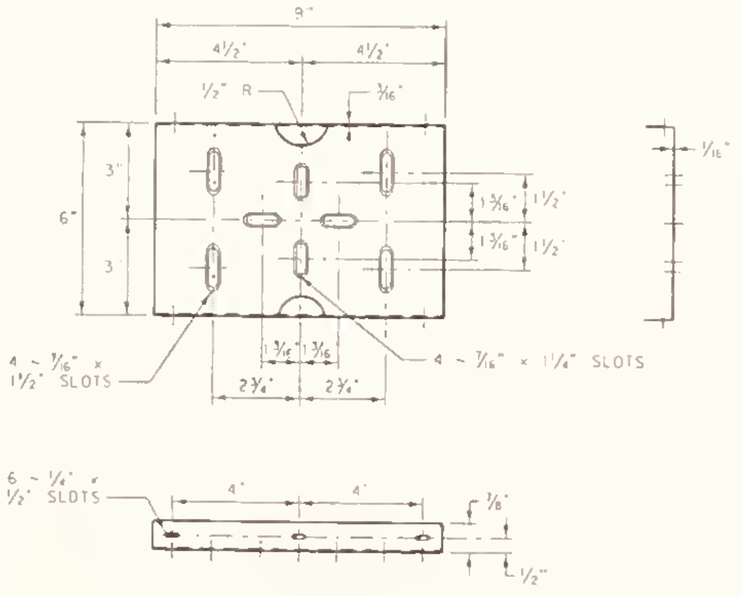
NARROW MEDIANS. MEDIAN WIDTHS GREATER THAN 76 FT. AND INDEPENDENT ROADWAYS REQUIRE SPECIAL DESIGN.

GRADES: UNIFORM BETWEEN INSIDE SHOULDERS OF MAIN TRAVELED WAY EXCEPT FOR SPECIAL DESIGN.
SURFACING: SEE PLANS FOR QUANTITIES.
DRAINAGE: USE 18" OR 24" CULVERTS IF REQUIRED.

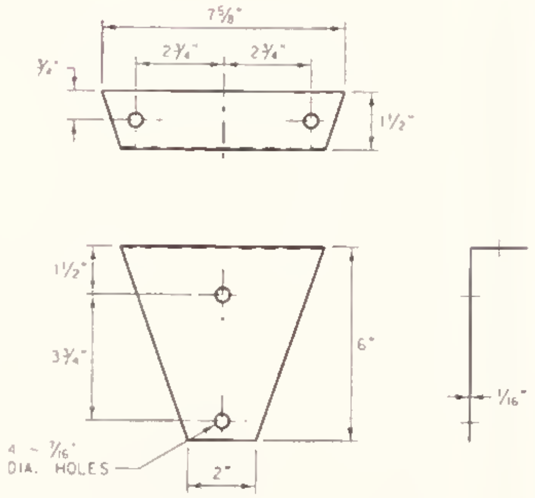
DETAILED DRAWING
REFERENCE
STANDARD SPEC.
SECTION
DWG. NO.
900-00
U-TURN MEDIAN OPENINGS
ON CONTROLLED
ACCESS HIGHWAYS
EFFECTIVE: AUGUST 1999
MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD


⅜" - 16 × ¾" HEX BOLT, 2 WASHERS, 1 LOCKWASHER, 1 NUT
⅜" - 16 × 4½" HEX BOLT, 2 WASHERS, 1 LOCKWASHER, 1 NUT
#8 - 32 × ¾ SLOTTED ROUND HEAD BOLT (STOVE BOLT), 2 WASHERS, 1 LOCKWASHER, 1 NUT
PLATFORM
BRACKET
4" × 4" WOODEN POST

SINGLE MAILBOX ASSEMBLY *



PLATFORM



BRACKET

NOTES:

GALVANIZE ALL MATERIALS PER AASHTO M 111

STAKE MAILBOX LOCATIONS BEFORE INSTALLATION FOR PROPER HEIGHT AND DISTANCE FROM THE ROADWAY. ONCE STAKED, NOTIFY THE ENGINEER AND THE POST OFFICE. THE ENGINEER AND POSTMASTER/MAILCARRIER ARE ALLOWED 48 HOURS TO REVIEW AND MODIFY THE STAKED LOCATIONS PRIOR TO FINAL INSTALLATION.

- OTHER CRASH TESTED MAILBOX SUPPORTS AND ASSEMBLIES MAY ALSO BE USED.

LOCATE THE MAILBOX 8 TO 12 INCHES OUTSIDE THE EDGE OF THE SHOULDER OR 6 TO 12 INCHES FROM THE FACE OF CURB.

USE MAILBOXES MEETING THE REQUIREMENTS OF THE STANDARD SPECIFICATIONS.

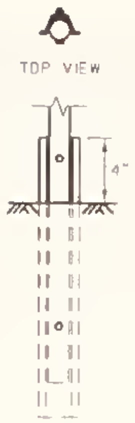
SEE "A GUIDE TO MAILBOX SAFETY IN MONTANA", 1996 EDITION, FOR ADDITIONAL INFORMATION.

DETAILED DRAWING
REFERENCE DWG. NO.
STANDARD SPEC. SECTION 900-05

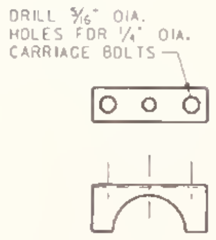
MAILBOX DETAIL

EFFECTIVE: AUGUST 1999

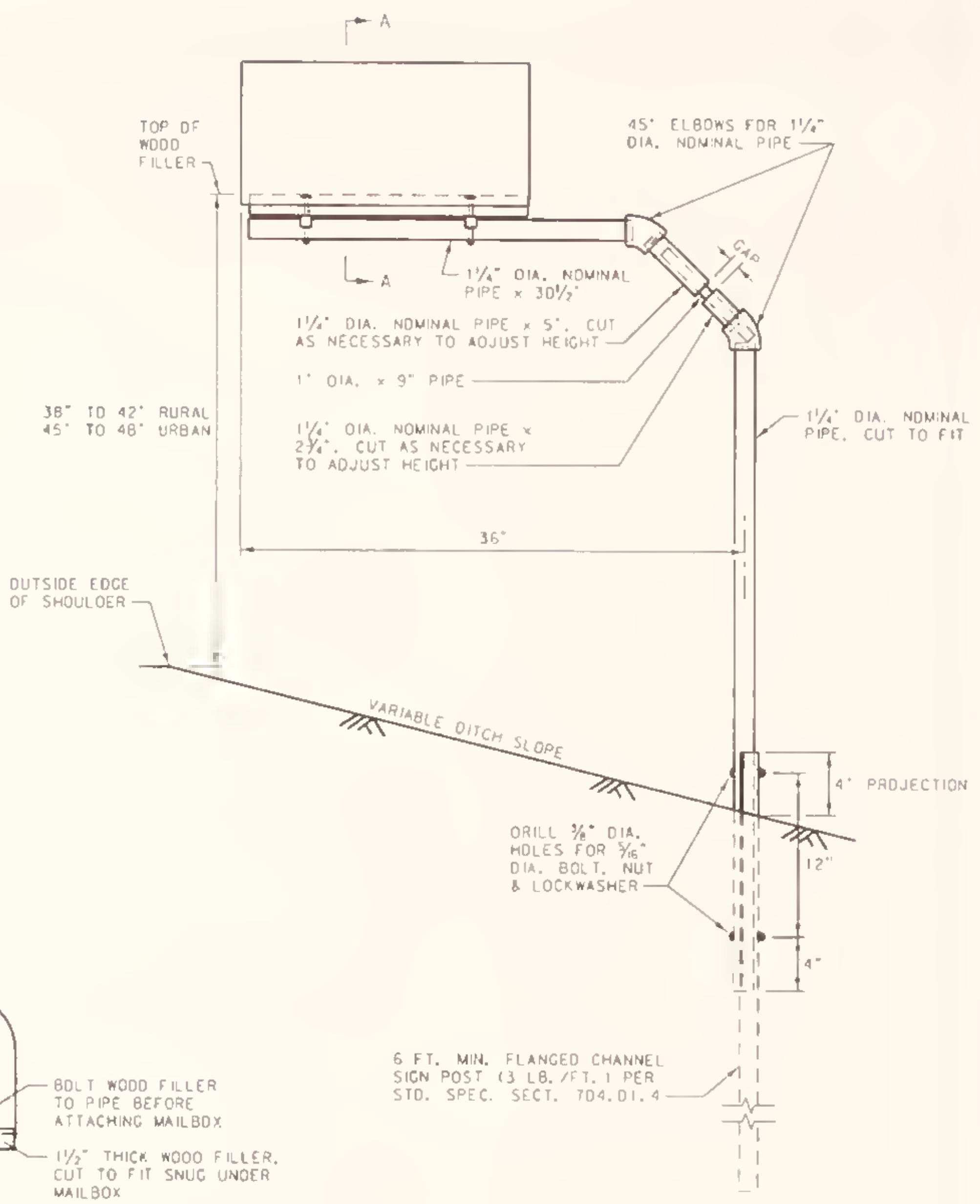
MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

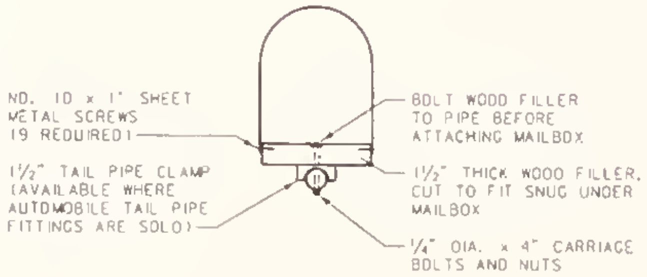


PIPE/POST CONNECTION
ROADWAY VIEW



TAIL PIPE CLAMP


A
A
TOP OF WOOD FILLER
45° ELBOWS FOR 1¼" DIA. NOMINAL PIPE
GAP
1¼" DIA. NOMINAL PIPE × 30½"
1¼" DIA. NOMINAL PIPE × 5", CUT AS NECESSARY TO ADJUST HEIGHT
1" DIA. × 9" PIPE
38" TO 42" RURAL
45" TO 48" URBAN
1¼" DIA. NOMINAL PIPE × 2¾", CUT AS NECESSARY TO ADJUST HEIGHT
1¼" DIA. NOMINAL PIPE, CUT TO FIT
36"
OUTSIDE EDGE OF SHOULDER
VARIABLE DITCH SLOPE
4" PROJECTION
DRILL ⅜" DIA. HOLES FOR 5/16" DIA. BOLT, NUT & LOCKWASHER
12"
4"
6 FT. MIN. FLANGED CHANNEL SIGN POST (3 LB./FT.) PER STD. SPEC. SECT. 704.01.4


NO. 10 × 1" SHEET METAL SCREWS (9 REQUIRED)
1½" TAIL PIPE CLAMP (AVAILABLE WHERE AUTOMOBILE TAIL PIPE FITTINGS ARE SOLD)
BOLT WOOD FILLER TO PIPE BEFORE ATTACHING MAILBOX
1½" THICK WOOD FILLER, CUT TO FIT SNUG UNDER MAILBOX
¼" DIA. × 4" CARRIAGE BOLTS AND NUTS

SECTION A-A

MAILBOX SUPPORT
STEEL PIPE WITH FITTINGS AND STEEL FENCE POST

NOTES:

GALVANIZE ALL MATERIALS PER AASHTO M 111.

STAKE MAILBOX LOCATIONS BEFORE INSTALLATION FOR PROPER HEIGHT AND DISTANCE FROM THE ROADWAY. ONCE STAKED, NOTIFY THE ENGINEER AND THE POST OFFICE. THE ENGINEER AND POSTMASTER/MAILCARRIER ARE ALLOWED 48 HOURS TO REVIEW AND MODIFY THE STAKED LOCATIONS PRIOR TO FINAL INSTALLATION.

OTHER CRASH TESTED MAILBOX SUPPORTS AND ASSEMBLIES MAY ALSO BE USED.

LOCATE THE MAILBOX 8 TO 12 INCHES OUTSIDE THE EDGE OF THE SHOULDER OR 6 TO 12 INCHES FROM THE FACE OF CURB.

USE MAILBOXES MEETING THE REQUIREMENTS OF THE STANDARD SPECIFICATIONS.

SEE "A GUIDE TO MAILBOX SAFETY IN MONTANA", 1996 EDITION, FOR ADDITIONAL INFORMATION.

DETAILED DRAWING
REFERENCE DWG. NO.
STANDARD SPEC. SECTION 900-10

OPTIONAL MAILBOX DETAIL

EFFECTIVE: AUGUST 1999

MDT MONTANA DEPARTMENT OF TRANSPORTATION
MONTANA CADD

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